



Primary Health Care Management Advancement Programme

SURVEILLANCE OF MORBIDITY AND MORTALITY



**MODULE 4
USER'S GUIDE**

THE PHC MAP SERIES OF MODULES, GUIDES AND REFERENCE MATERIALS

Each module includes:

- a User's guide
- a Facilitator's guide
- computer programs

Module 1 Assessing information needs

Module 2 Assessing community health needs and coverage

Module 3 Planning and assessing health worker activities

Module 4 Surveillance of morbidity and mortality

Module 5 Monitoring and evaluating programmes

Module 6 Assessing the quality of service

Module 7 Assessing the quality of management

Module 8 Cost analysis

Module 9 Sustainability analysis

Manager's guides and references

- Better management: 100 tips
- Problem-solving
- Computers
- The computerised PRICOR thesaurus

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Cover photo: Surveillance systems track the occurrence of common diseases, such
as acute diarrhoea among children at the International Centre for
Diarrhoeal Disease Research, Bangladesh

Photo by: Jean-Luc Ray for AKF



THE AGA KHAN UNIVERSITY



AGA KHAN FOUNDATION

Primary Health Care Management Advancement Programme

SURVEILLANCE OF MORBIDITY AND MORTALITY

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MODULE 4 USER'S GUIDE



Aga Khan Health Services



University Research Corporation
Center for Human Services



The surveillance of undernutrition and other nutritional problems requires regular monitoring of the growth and development of children under age five years

Photo by Pierre Claquin for AKF

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***Dedicated to
Dr. Duane L. Smith (1939-1992),
Dr. William E. Steeler (1948-1992)
and all other health leaders, managers and workers
who follow their example in the effort to bring quality health
care to all in need.***





Screening for and surveillance of anaemia is important among women of childbearing age, particularly wherever malaria and hookworm remain problems, such as in Bangladesh

Photo by Jean Luc Ray for AKF



An overview of PHC MAP

The main purpose of the Primary Health Care Management Advancement Programme (PHC MAP) is to help PHC management teams collect, process and analyse useful management information.

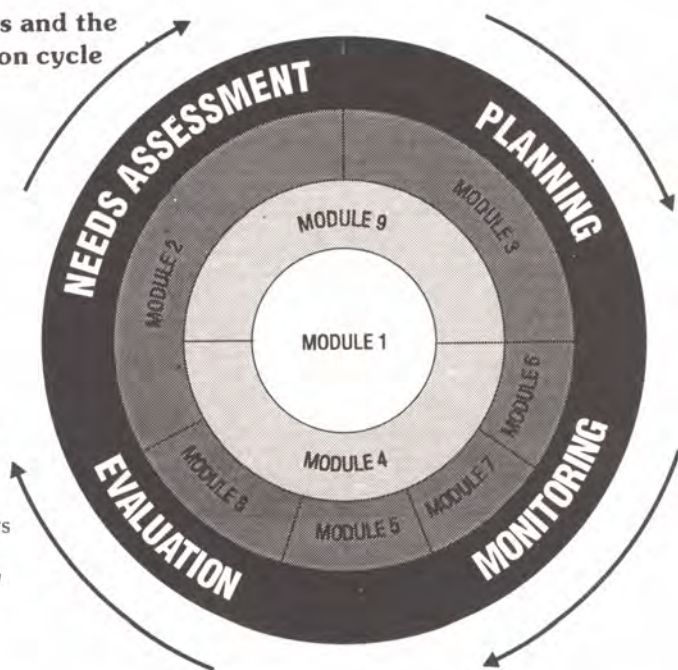
Initiated by the Aga Khan Foundation, PHC MAP is a collaborative programme of the Aga Khan Health Network¹ and PRICOR.² An experienced design team and equally experienced PHC practitioner teams in several countries, including Bangladesh, Chile, Colombia, the Dominican Republic, Guatemala, Haiti, India, Indonesia, Kenya, Pakistan, Senegal, Thailand and Zaire, have worked together to develop, test and refine the PHC MAP materials to make sure that they are understandable, easy to use and helpful.

PHC MAP includes nine units called modules. These modules focus on essential information that is needed in the traditional management cycle of planning-doing-evaluating. The relationship between the modules and this cycle is illustrated below.

PHC MAP modules and the planning-evaluation cycle

PHC MAP MODULES

1. Information needs
2. Community needs
3. Work planning
4. Surveillance
5. Monitoring indicators
6. Service quality
7. Management quality
8. Cost analysis
9. Sustainability



1 The Aga Khan Health Network includes the Aga Khan Foundation, the Aga Khan Health Services, and the Aga Khan University, all of which are involved in the strengthening of primary health care.

2 Primary Health Care Operations Research is a worldwide project of the Center for Human Services, funded by the United States Agency for International Development.



Managers can easily adapt these tools to fit local conditions. Both new and experienced programmers can use them. Government and NGO managers, management teams, and communities can all use the modules to gather information that fits their needs. Each module explains how to collect, process and interpret PHC-specific information that managers can use to improve planning and monitoring. The modules include user's guides, sample data collecting and data processing instruments, optional computer programs and facilitator's guides, for those who want to hold training workshops.

The health and management services included in PHC MAP are listed below.

Health and management services

HEALTH SERVICES		MANAGEMENT SERVICES
GENERAL PHC household visits Health education	OTHER HEALTH CARE Water supply, hygiene and sanitation School health Childhood disabilities Accidents and injuries Sexually transmitted diseases HIV/AIDS Malaria Tuberculosis Treatment of minor ailments Chronic, non-communicable diseases	Planning Personnel management Training Supervision Financial management Logistics management Information management Community organisation
MATERNAL CARE Antenatal care Safe delivery Postnatal care Family planning		
CHILD CARE Breast feeding Growth monitoring Nutrition education Immunization Acute respiratory infection Diarrhoeal disease control Oral rehydration therapy		

Several manager's guides supplement these modules. These are: *Better management: 100 tips*, a helpful hints book describing effective ways to help managers improve what they do; *Problem-solving*, a guide to help managers deal with common problems; *Computers*, a guidebook providing useful hints on buying and operating computers, printers, other hardware and software; and *The computerised PRICOR thesaurus*, a compendium of PHC indicators.





Antenatal care and the early detection and surveillance of
high risk pregnancies are essential for lowering maternal
mortality rates

Photo by Jean Luc Ray for AKF



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In May 1992, based on recommendations from the International Conference on Management and Sustainability of PHC programmes and the PHC MAP Technical Advisory Committee, the PHC MAP Management Committee decided to add a module on surveillance to the PHC MAP series. An outline was agreed upon in August by the authors.

Ms. Veronica Walker had the difficult task of liaison among the authors in Geneva, Jakarta and Karachi, and between the authors and the reviewers, in addition to typing several draft versions of the text. Her contribution is gratefully acknowledged.

This module draws heavily from, and is patterned after, the excellent WHO/EPI manual, *Training for mid-level managers: Disease surveillance*. It also reflects, complements, and draws on material developed for Module 2, *Assessing community health needs and coverage* and Module 5, *Monitoring and evaluating programmes*, especially the instruments and indicators on mortality and morbidity. It also draws on material developed for Module 3, *Planning and assessing health worker activities*, particularly the CHW and clinic registers, which can easily be adapted for surveillance purposes. The verbal autopsy material is based, in part, on material prepared by Dr. Abhay Bang of the Society for Education, Action and Research in Community Health (SEARCH) Gadchiroli, Maharashtra, India. Thanks also to Dr. Ron Gray of the Johns Hopkins University for his contributions to this section.

The text was prepared by Drs. Claquin and Reynolds. Dr. Marsh prepared the material on cause of death and "verbal autopsies." We wish to thank the participants of the Bangkok conference for their strong recommendation that this module be added to the series, and especially David Fraser, Peter Tugwell, Khatidja Hussein, and Hugh Annett, who lobbied convincingly for its inclusion and who contributed their ideas and time to the development of the outline. We also want to thank Paul Richardson for his contributions to the internal debate on measuring mortality. The results are reflected in this module, as well as in Modules 2 and 5.

The draft was tested in Nairobi, Kenya during an Aga Khan Health Service, Kenya, workshop in September on, "Introduction to the use of Epidemiology in the Surveillance of Morbidity and Mortality." Feedback from all participants and facilitators, especially Dr. Joseph Valadez and Dr. Ruth Chungu, led to simplification of the text in November and December.

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Quick start

Setting up a basic surveillance system

This is a simple program that you can use to set up your own surveillance system. The program is on the diskette that comes with this module, named MOD4_QS. Simply load it into a spreadsheet, such as *Lotus 1-2-3* or *Quattro Pro*, then just follow these instructions. You can also do this manually. Just fill in the data table and make up your own graphs.

The objective of this simple surveillance system is to monitor trends in morbidity and/or mortality of up to five diseases, or some other indicators that interest you. You can monitor anything you wish, as long as you have the data to do so. This program assumes that you have, or will be able to get, the data you need.

First, decide which indicators you want to monitor. You should begin by identifying your major target groups, your health goals for them, and the indicators you will use to assess progress. You may have selected these indicators when you went through Module 1. If not, you can enter your summary in the following table. Here is an example:

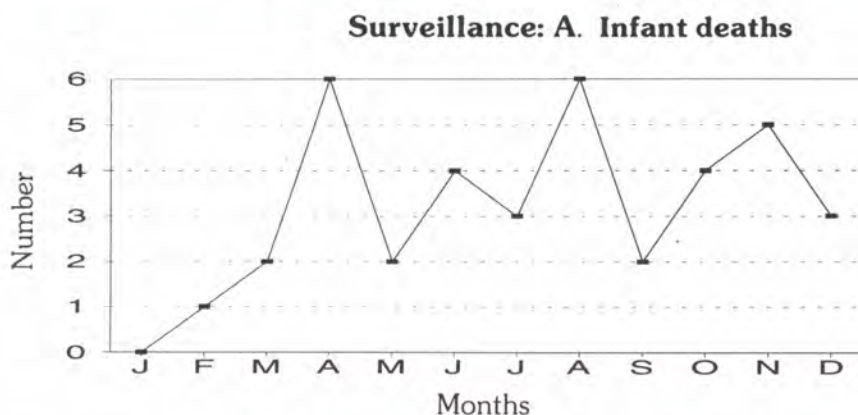
Target groups	Health goals	Indicators
Children < 2 years	Reduce mortality	No. of deaths of children < 1 year
	Reduce morbidity	No. of children < 2 years with 3rd degree malnutrition
	Reduce disability	No. of cases of immunizable preventable diseases
Married women 15-49 years	Reduce mortality	No. of maternal deaths
	Reduce fertility	No. of live births

Set up a table like the one below. Revise it to fit your own calendar. Enter up to five indicators in the left hand column. Each month tabulate the number of cases reported and enter them into the table. Here are some illustrative data.

Table 1	J	F	M	A	M	J	J	A	S	O	N	D	Tot.
A. Infant deaths	0	1	2	6	2	4	3	6	2	4	5	3	38
B. 3rd degree malnutrition	23	32	14	18	22	26	32	38	44	56	54	52	411
C. Cases imm. prev. dis.	3	1	2	0	0	3	0	9	8	7	8	4	45
D. Maternal deaths	0	0	0	0	1	0	0	1	2	0	0	0	4
E. Live births	12	15	22	45	42	38	30	48	54	43	56	38	443



If you use the computer file that comes with this module, it will tabulate the totals for you and produce a graph for the first indicator (A). When you enter new data, the totals in the table and the graph will update themselves automatically. If you want to see a graph of another indicator, press /Graph, Name, Display, and select one of the names (A, B, C, D, E) and press Enter.



This is a very basic graph (it is a "Quick start," after all). You can make more informative and sophisticated graphs. See the suggestions and templates in the appendices.



Introduction

What is surveillance?

Surveillance of morbidity and mortality is the collection and analysis of selected health and vital events to:

- identify, investigate and control outbreaks or epidemics
- identify specific population groups at high-risk of illness and death from priority diseases
- confirm current priorities among disease control activities
- evaluate the impact of preventive and curative control activities on the incidence and prevalence of priority diseases in the community
- monitor disease trends so as to adjust plans to meet current needs

A more formal definition comes from the Centers for Disease Control (CDC), which defines epidemiological surveillance as "the ongoing and systematic collection, analysis and interpretation of health data in the process of describing and monitoring a health event. This information is used for planning, implementing and evaluating public health interventions and programs. Surveillance data are used to both determine the **need** for public health action and to assess the **effectiveness** of programs."¹

In the PHC MAP framework, morbidity and mortality surveillance data are used largely for monitoring and evalu-

¹ Guidelines for evaluation surveillance systems. CDC Morbidity and monitoring weekly report supplement. Vol 37, No. S-5, May 6, 1988



ation to determine whether the programme is having an **impact on health**. As such, it is an important tool that you can use to see if you are reaching your health goals. But surveillance data can also be used to assess health needs and to set health goals in planning. Whereas Module 2 concentrates on assessing health **coverage**, Module 4 is the one that concentrates on assessing health **status**.

In this module, surveillance is presented largely as a technique for monitoring and evaluating morbidity and mortality. And two levels of analysis are included. The first is **quantitative** surveillance of the **number of cases** of a given disease or death. The second is **qualitative** investigation of the **causes** of a disease or death.

Managers need to have accurate information on the number of cases and the percentage of their target groups

	Morbidity	Mortality
Incidence	morbidity reports	mortality reports
Cause	case, outbreak investigation (diseases)	case, outbreak investigation (autopsies)

that are affected by a specific disease, and that are dying from specific diseases. They need this information to be able to evaluate the impact of their PHC strategy on health and to determine if core PHC services are effective.

Sometimes they also need to know what has caused a particular death or the outbreak of a particular disease. This information may be essential to make sure that the assumed causes are confirmed, and to adjust the programme to prevent such events from happening again.

Surveillance does not have to be complex to be useful. In fact, a common problem with many surveillance systems is that they are too complex and too large. By trying to collect comprehensive information on all diseases, there is little time left for analysis of the data and for taking action to reduce the number of cases of disease. For this reason, we strongly recommend that you collect only as much data as you can use and that you concentrate on the most important health problems.

Collect only as much data as you can use



Principles of surveillance

The following list will give you an idea of what makes up a good surveillance system. According to CDC guidelines, an effective surveillance system:

- addresses health events which are of considerable public importance, i.e., cause a substantial amount of morbidity and/or mortality, and are amenable to practical control or prevention;
- identifies and correctly classifies a large proportion of target health events;
- correctly reflects the distribution of events over time, place, and person;
- consists of components which include clear definitions of health events under surveillance, a clear and logical path for data flow, adequate knowledge of the population under surveillance and defined and appropriate methods for collection, analysis, interpretation and feedback of information
- gives rise to meaningful and effective public health action based on the data processed in the system
- is uncomplicated
- is adaptable and responsive to new demands
- engenders a high level of participation
- provides information rapidly enough to allow effective action to be taken
- requires minimal resources appropriate to the circumstances.¹

**Characteristics
of good
surveillance
systems**

Surveillance systems are often national or regional in scope. They are designed to collect data on specific diseases, such as AIDS, for use in national policy-making. The systems we are suggesting in this module use the same methods, but are designed to be used at local levels, to help PHC managers monitor morbidity and mortality in their own programme area. As such, they can reflect the health priorities and concerns of local communities.

¹ Ibid



An example

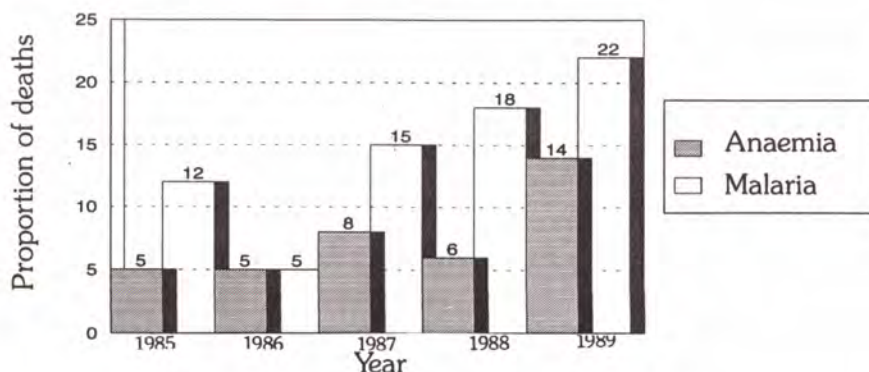
The University Medical Centre in Lome, Togo, has been monitoring data on paediatric deaths for nearly a decade. It is one of the few sites in Togo that has enough data to evaluate changes in infant mortality over time. Table 1 shows the ten leading causes of death among children less than five years of age in 1989. Malaria tops the list, accounting for one out of five deaths, followed by anaemia (13%) and malnutrition (12%).

This type of data has been collected every year since 1985. Figure 1 shows the data on malaria and anaemia deaths for the five-year period 1985-1989. The data clearly show an

Table 1: Leading causes of death of children under age 5, Togo, 1989

Cause	No. deaths	Percentage
Malaria	199	22
Anaemia	117	13
Malnutrition	113	12
ALRI	85	9
Meningitis	66	7
Diarrhoeal diseases	58	6
Coma, NOS	42	5
Tetanus	20	2
FUO	19	2
Hepatitis	18	2

Figure 1: Proportion of paediatric deaths from malaria and anaemia, Togo, 1985-1989



upward trend in the proportion of deaths due to these two diseases. The anaemia deaths, were associated with malaria.¹

Limitations of surveillance

Surveillance is a labour-intensive activity. It requires much effort to collect the needed data, especially if it is not already being collected as part of a routine recording and reporting system. Tabulation and analysis of the data is also time-consuming. For these reasons, most systems are limited to a few key indicators.

It can take several years of data collection before trends can be identified, particularly for diseases, such as dengue, that break out every five years or so. You may be able to use retrospective data to look at past trends, but this is often difficult. This is because the indicators you want may not have been collected, are slightly different than what you need, or are not reported consistently.

It can be difficult to assess impact if your target population is small, or if you cannot set up control groups to compare disease patterns between programme and non-programme areas. You need a large population to compute rates, especially mortality rates, and it may be difficult to identify all of the deaths that occur in your area.

Reporting of surveillance data is often incomplete, especially from remote areas. Some programmes are fortunate to get 50% reporting, and even those reports may be incomplete or include errors which go undetected, if they are not checked carefully.

Despite these limitations, surveillance can be an important tool for PHC managers. It can help identify changes in diseases and injuries that require immediate action. And by investigating causation, a manager can often identify programmatic changes that could help prevent a problem from recurring.

**Reporting of
surveillance
is often
incomplete**

1 Vernon, A. *Cause of death from hospital data in developing countries: A review based on the CCCD experience with hospital-based mortality surveillance systems in Sub-Saharan Africa*. Draft discussion paper, 9 May, 1992.



Surveillance methods

This module describes, and recommends, four surveillance methods. There are actually six principal methods, but two of them, vital registration systems and censuses, are not often feasible in developing countries. The six methods are summarised below.

Surveillance methods	Description
Routine reporting systems	Information is routinely collected and reported by PHC staff
Sentinel reporting systems	A small number of reporting units (usually health centres or hospitals) carefully collect and report requested data
Surveys and special studies	Sample surveys are conducted periodically to estimate the level of a disease or condition in a given area
Case/outbreak investigations	Special investigations are undertaken to determine the cause of a disease or death and to recommend action to prevent its recurrence
Vital registration systems	Public and private health providers report births, deaths and other selected data to a central system
Census	A count of all of a population, often including questions about health habits, diseases, etc.

The first three of these methods are used largely to gather quantitative information about the incidence of diseases and deaths. The fourth is used to investigate the causes of diseases and deaths.

1. Routine reporting systems

In routine reporting, health staff, and sometimes, non-health people, collect information about the **number of cases** of reportable diseases and of selected deaths that occur in their area. Data are collected as a part of the routine screening and diagnosis process during home visits or during visits to health facilities, health centres and hospitals. Thus, the reports are based on direct contacts with the individual who is sick, dying, or has died. In some cases the information is provided second-hand from a relative, often the mother, friend or neighbour.

Routine data is usually recorded in family or individual folders and then transferred to summary tally sheets for reporting of the aggregated data. At the end of each month the information is compiled and sent to a supervisor for further compiling and analysis.



Most routine reporting revolves around health centres and hospitals. They obtain information from staff within the facility and from reports prepared by CHW's and other outreach workers. In some cases, community members help collect data from households.

Advantages. Routine systems have the advantage of taking data from an ongoing system. Thus, they are inexpensive and efficient ways to collect information. A new system, with additional staff to operate it, does not have to be set up. The data cover all health activities from routine well-baby clinics to surgery. The recording and reporting systems have been standardised, which means that the same definitions are used throughout the system, the same type of data is collected, and the same reporting periods are used. This is a great advantage for making comparisons among areas.

**Routine
reporting
systems
are usually
standardised**

Disadvantages. These systems almost always provide an incomplete picture of the total number of cases that occur. Some of the reasons for incomplete reporting are:

- Not all cases come to the health facility for treatment. Some people go to private providers for treatment, others to facilities outside the area, still others do not seek treatment at all. Distance, transportation costs, hours of operation, loss of income, cultural taboos, and many other reasons tend to limit the use of health facilities.
- Not all cases are identified by outreach workers. CHW's may visit a household only once every 3-6 months, and are likely to miss many cases that are not picked up by the health facilities. When they do visit, they may neglect to ask about health problems that happened months ago, and the mother may not consider them important enough to report on.
- Some diseases, such as neonatal tetanus, are more commonly treated at hospitals than health centres, and therefore go undetected by the health centre and CHW.
- Complete and accurate reporting are always a problem in PHC. Some CHW's are illiterate, others concentrate on the most pressing concerns; some nurses and doctors skip over some items because they are too busy, they don't



believe the item is important, or they didn't ask. Even when reporting is fairly regular and complete, there may be inconsistencies among health workers if they don't use the same procedures, definitions and guidelines.

Nevertheless, routine reporting is the most common method used in surveillance. And because it is so inexpensive, it is likely to be attractive to many PHC managers.

2. Sentinel reporting systems

In sentinel systems, a small number of health units in a programme area is selected to report cases of diseases and deaths that are seen and diagnosed at their facility. They may also be asked to report additional information, such as the age and immunization status of the children treated at the facility. Staff at sentinel sites are given special training and supervision to ensure that reporting is complete and accurate.

The sites chosen are not necessarily chosen because they are representative of a given area. They may be chosen because they are likely to see cases of certain diseases, or because their caseloads are high enough that rare events are likely to be identified. Other criteria that are important are: reliability of data collection, timeliness of reporting, willingness of the staff to participate, high-quality laboratory or diagnostic capabilities.

Hospitals are often included as sentinel sites, since they are likely to have much higher caseloads than health centres, they are more likely to see serious diseases, infant and maternal deaths are more likely to occur there, and they are more likely to have staff trained in diagnosis and data processing.

Advantages. Sentinel sites may provide a more consistent picture of illness in a given area than routine reporting. Data collected from these sites may also show whether routine reporting is accurate or not. In addition, being chosen to participate in surveillance tends to motivate the staff to do the best they can to report accurately and on time.

Disadvantages. A major disadvantage of sentinel systems is that they are not representative of the entire population at risk. The data they generate may not be of sufficient volume to generate rates and ratios, which are important for

Selecting sentinel sites



assessing changes in health status. Another disadvantage is that populations served by the sentinel facility may change, making the study of trends invalid.

Nevertheless, the sentinel system has a major advantage in the quality of the data produced. They are also relatively inexpensive to set up and operate, especially in contrast to a "universal" system where all potential facilities would be required to report.

3. Surveys and special studies

Sample surveys, such as those described in Module 2, are often used for surveillance. They usually provide a broad estimate of the incidence or prevalence of a disease. They can also be used to estimate mortality rates, although the sample sizes required to do this are very large. Surveys can also be used to evaluate the reliability of the routine or sentinel systems. For example, a morbidity and mortality survey in a high-risk, underserved population may be a more accurate and practical method for measuring disease patterns that tend not to be seen at health facilities.

The surveys usually have to be repeated periodically, at least annually, to develop trend data. Although this can be expensive, the rapid surveys described in Module 2 are an affordable option. They also relieve the health staff of the burden of continual reporting.

4. Case and outbreak investigations

These investigations are attempts to identify the causes of a death or disease. They are not alternatives to routine and sentinel systems, but are used as the next step in epidemiological investigation. In general, a "case" investigation is an investigation of a **single case** of a disease or death; an "outbreak" investigation is an investigation of **many cases**. However, when the occurrence of a particular disease is very low, polio for example, even one case can be considered an "outbreak."

Purposes. The usual purposes of these investigations are to:

- confirm diagnoses and determine the causes (main/leading and associated)
- confirm the existence of an outbreak (an increase in the

**Purposes of
epidemiological
investigation**



number of expected cases/deaths)

- identify the most appropriate control measures
- identify where and to whom to apply these measures
- determine why the outbreak occurred
- determine what can be done to prevent similar outbreaks in the future

These investigations are conducted systematically, usually following a written protocol and a logical cause-effect chain of events to identify the underlying cause of the problem. An example of a protocol for a neonatal tetanus investigation is found in Appendix C.

Advantages. These investigations have a programmatic as well as a medical objective. They can identify errors that should be corrected (e.g., using contaminated needles) and procedures that could be changed to prevent problems from occurring in the first place (e.g., increase home visits to monitor high-risk infants). The investigations can provide staff with a chance to learn more about the conditions and causes of diseases and deaths. They can use this information to improve internal procedures, and also to help community members understand what they can do to prevent unnecessary health problems.

Verbal autopsy. A special technique for case investigations of deaths, the "verbal autopsy," is featured in this module. A PHC health worker, who needs to be trained in the technique, conducts an in-depth investigation of the death through interviews with the mother and anyone else who was a witness to the death and the circumstances leading up to it. See Appendix E.1 for the instrument that is used.

The decision to conduct a case/outbreak investigation may be triggered by a standard protocol, such as investigate every case of polio, neonatal tetanus, and hepatitis; or, investigate every neonatal and maternal death. In many cases the decision may depend on the circumstances. If a strange or unexpected event occurs, this might be enough reason to investigate it, especially if it could be a threat to health.



In summary, each of these methods has its advantages and limitations. You may want to try a combination of systems, relying on your existing reporting system for as much data as is reasonable, setting up a small sentinel system to continuously gather additional data on a few important health problems, and adding mortality and morbidity questions to an annual community survey to assess changes in health needs as well as coverage.

**Each method
has advantages
and limitations**

Also, don't expect too much of your surveillance system. Surveillance usually monitors outcome data - impacts and effects. A good system might identify changes in outcomes, but it will not necessarily explain what caused the changes. You may need to use other modules in the PHC MAP series to look more closely at programme inputs, processes, and immediate outputs to find the cause of a problem - or of a success.

How to use this module

Who and when

This module is designed to provide PHC managers, whether working in government or private organisations, with simple and inexpensive tools for setting up and operating a local surveillance system.

PHC managers are not likely to design or operate the system themselves. Staff with a background in planning, evaluation, MIS, as well as epidemiology and any similar discipline, can easily learn how to use the tools in this module to set up a system.

PHC consultants, especially those who are interested in data for decision-making, should also find the module helpful.

How the module is organised

The module can be easily adapted to meet local needs. The procedures that are described in the next section are general and flexible. Those programmes that already have a surveillance system will find that the module can help them simplify their system. Those who do not have a system already should find that they can start small, designing a highly focused system of a few indicators at first, and expanding it later if it proves to be worthwhile.

This User's guide has two main sections, in addition to



the Introduction and Quick start. Procedures (or steps) come next, describing a simple, but systematic process you can go through to determine the kind of surveillance you need and how to set up a system that meets your needs. The appendices contain useful guidelines, worksheets, and tools that you can use in designing your surveillance system.

**The User's
guide has two
main
sections**

There is a computer file that comes with this guide that includes a number of "templates" in *Lotus 1-2-3* and *Quattro Pro*, or pre-designed tables that you can use to tabulate your data. Each template includes pre-designed graphs that you can display just by pressing one or more keys on your computer's keyboard.

A Facilitator's guide has also been developed to help you set up a workshop to train staff to use the module.

How to begin

If you haven't tried the Quick start section, you may want to do so, just to see how easy it is to set up a simple, but useful surveillance system. Then go to the next section and read through the Procedures. This should give you a better idea of what a surveillance system involves and the kind of system you want for your programme.



Surveillance procedures

This section describes how you can design and operate your own surveillance system using one or more of the methods described in the Introduction. There are eight steps in these procedures. The first three describe how to design a system that will meet your needs. The next two describe how to develop the appropriate data collection procedures and then to collect and tabulate the surveillance data. The last three steps describe how to analyse and interpret the data so that you can take action quickly, if indicated, and report your findings to others who might benefit from your information. These nine steps are summarised below.

Steps in designing and operating a surveillance system

- Step 1:** Specify the objectives of surveillance
 - Step 2:** Define the surveillance data to collect
 - Step 3:** Select the surveillance methods
 - Step 4:** Develop the data collection procedures
 - Step 5:** Collect and tabulate the data
 - Step 6:** Analyse the data
 - Step 7:** Investigate causation (optional)
 - Step 8:** Take action
 - Step 9:** Prepare and present reports
-

The major decisions you will have to make can be recorded on the worksheets illustrated in this section. There are blank worksheets in the Appendices that you can copy.



Step 1: Specify the objectives

Before you begin to design a system it is very important that you are absolutely clear on what the system is supposed to do. This step guides you through a simple process to help you specify:

Have clear objectives for surveillance

- 1) **purposes** of the surveillance
- 2) **users** of the information that the system produces
- 3) **scope** of the surveillance (which geographic area and which PHC services it will cover)
- 4) **target groups** that will be monitored
- 5) whether you just want to identify **cases** of mortality and/or morbidity only, or, also the **causes** of mortality and/or morbidity
- 6) **time period** the surveillance will cover - one year, five years, three months and how frequently you will collect and process your surveillance data.

WORKSHEET 1: SPECIFYING THE OBJECTIVES OF SURVEILLANCE

Purpose(s)

- ☐ Assess needs
☐ Identify risk factors
☒ Identify outbreaks
☐ Identify unusual events

- ☒ Monitor trends
☒ Evaluate impact on infant & maternal mortality
 Other: _____
 Other: _____

User(s)

- ☐ Board of directors
☒ Government officials
☐ Supervisors
☐ Donors

- ☐ PHC Manager
☐ PHC Staff
☐ Other: _____
☐ Other: _____

Scope

- ☒ Geographic area(s):
☒ Programme service(s):

- * local Communicable Disease Centre
Entire project area
M/M preventable by PHC services

Target group(s)

- ☒ Children 1 month
☒ Children 12-23 months
☐ Children 1-4 yrs
☐ Children < 5 yrs

- ☐ Women 15-49 yrs
☐ Married women 15-49 yrs
☒ Pregnant women
 Other: _____

Cases

- ☒ Mortality
☒ Morbidity

Causes

- ☒ Mortality
☐ Morbidity

Other

- ☐ Specify: _____
☐ Specify: _____

Time period: 12 months

Frequency: Monthly & quarterly



If you completed Module 1, it can be very helpful to refer to Worksheets A and B. They will help you remember your overall information needs and how surveillance fits in. When you define what you want to monitor, keep your programme's goals clearly in mind. If a goal is to reduce mortality or malnutrition, then this is probably what you should design your surveillance system to monitor.

It may be useful to go through this step with a group, so that all significant points of view are heard. Involve the potential users of the information if at all possible. Make sure someone is in the group who understands what can and cannot be collected. This will help you avoid designing an unrealistic system. Also, make sure that the objectives are limited to something reasonable. Don't try to measure everything. It is probably a good idea to limit it to 3-5 important items, especially if your programme is small.

Purposes of surveillance

1. Purpose: First you need to specify the purpose of your system. Most systems can be used to meet several purposes, especially if they are designed to do so from the beginning. Among the principal purposes are the following:

- **Assess needs.** You may want to confirm that your current disease control activities are correct, or you may want to update an assessment of needs in your area.
- **Identify risk factors.** You may want to identify specific population groups that are at high-risk of illness and death so that you can develop interventions to protect them.
- **Identify outbreaks.** A major purpose of surveillance is to identify quickly any outbreak or epidemic so that it can be brought under control. Outbreaks of communicable diseases, such as measles and AIDS, are especially serious and should be identified and acted upon immediately.
- **Identify unusual events.** Equally important is to identify quickly any event that is unexpected but a serious threat to health. Examples would be a number of deaths from drowning and food poisoning among school-age children.
- **Monitor trends.** Many diseases are seasonal and you may want to watch trends to identify unusual deviations from expected patterns. You may also want to track improvements in disease control over time.

Surveillance systems will alert you to a problem



- **Evaluate impact.** Most managers want to know if their programme is having any impact on health. Surveillance can help you watch key trends, for example, in infant mortality and the incidence of diarrhoeal diseases.
- **Explain causes.** In some situations you may want to investigate the cause of an illness or death to determine whether your programme can do anything in the future to prevent such an occurrence. Some programmes investigate every maternal death for this reason. Others look at reasons for complications during childbirth to identify changes in procedures that might be warranted.

Don't expect your surveillance system to tell you everything; it will mainly alert you to a problem. Then you can use some of the other modules in the PHC MAP series to get more detailed information on the cause of the problem.

2. Users: The person or persons who will use the results of the surveillance system should decide what the purpose is, and specify the scope, target groups and other elements of the surveillance objectives. Otherwise the information will be of little use.

There may be one primary user, often the PHC manager, and one or more secondary users, superiors, donors, and so forth. If your system will be part of a larger regional or national system, then you will probably be expected to report your findings to your communicable disease centre.

If you have multiple users, take care to make sure that each of them is consulted. You may have to negotiate compromises to avoid designing an enormous system to meet everyone's needs.

3. Scope: Next, make sure to define the scope of the geographic and programmatic areas to be monitored. Most programme managers would like to monitor their entire catchment area and all major diseases, but that may be too much to be feasible. You may have to settle for setting up a sentinel system that is representative, or that watches for specific diseases. Set priorities. Identify what is most important in your situation.

Set priorities



Table 2: Common priority diseases and health problems for surveillance in developing countries

Vaccine-preventable diseases	Enteric diseases	Parasitic diseases
Measles Neonatal tetanus Tuberculosis Poliomyelitis Diphtheria Pertussis Mumps	Cholera Dysentery Watery diarrhoea	Malaria Onchocerciasis Schistosomiasis Lymphatic filariasis Leprosy Ascariasis Guinea worm Trypanosomiasis
Pregnancy-related problems	Other infectious and communicable diseases	Other important diseases
Obstructed labour Eclampsia Prematurity Post-partum infection	Chicken pox* Yellow fever Meningitis Haemorrhagic fever	STD/HIV/AIDS Malnutrition Anaemia Heart disease Diabetes

*Several epidemiologists have recommended monitoring chickenpox as a measure of the quality of surveillance.

4. Target groups: Most PHC programmes have a limited number of target groups, usually children under age five or under age three years, or two to four years old, etc., and married women in the reproductive age range. Don't try to monitor all age groups for all diseases, unless you plan to set up a comprehensive system. Again, set priorities. Which are your priority target groups, and what aspect of their health are you most concerned about? If you completed Worksheet A (in Module 1), you have probably already identified your key target groups and the impact goals you want to measure.

5. Cases and/or causes: You will need to decide if you just want to monitor quantitative data on the number of cases that occur, or if you also want to know the causes of a death or disease. The latter requires an investigation, which can be time-consuming and expensive. You may want to be selective and only investigate causes of major outbreaks, infant deaths, and certain high-priority concerns, e.g., a decline in nutritional status.

6. Time period and frequency: You will probably want to monitor events for several years, and process your data every one to three months. This will enable you to develop trend patterns. In some cases, if you have the data, you may



want to go back in time to examine previous trends. If the data are available, that could be a useful and not particularly expensive undertaking.

Other considerations: Although this module concentrates on mortality and morbidity, keep in mind that you can use surveillance systems to monitor a number of other things, as well. For example, you can monitor coverage; numbers of children fully immunized; numbers of new acceptors of family planning. You can also monitor disabilities and fertility. If any of these are important to you, make sure you include them in your design.

Don't be afraid to leave some of these substeps incomplete at first, and to come back to this step later to revise your objectives. You may find out as you go along that some objectives are just not feasible, or that some are more important than you originally thought.

Step 2: Define the data to collect

This step guides you through a series of substeps to determine precisely which data your system will collect, how frequently, from which source, and using which procedure. You can use Worksheet 2 to keep track of your decisions. This step is a bit more technical than Step 1, so you may not want to have too large a group working on it. It would help to have at least one representative of management, one or two staff who understand the current record-keeping system, and one person, perhaps a consultant, who understands the requirements for and constraints on collecting data on mortality and morbidity. Again, remember to keep your programme's goals in mind when deciding what to monitor.

Target group mortality. Enter the target groups you identified in Step 1 in the left column of Worksheet 2. In the next column enter whether you are going to monitor the **mortality** of each target group.

It is generally unrealistic to try to monitor all deaths. The more practical, and programmatic priority, would be to monitor:

- **maternal deaths:** These are deaths that occur during pregnancy, delivery, and up to 42 days after delivery.
- **infant deaths:** These are deaths that occur between birth and the first birthday. You may want to distinguish

**Focus on
programme
goals when de-
ciding what to
monitor**



WORKSHEET 2: SPECIFY THE SURVEILLANCE PROCEDURES

Step 2: Define the data to collect			Step 3: Select the methods and procedures		
Target group	Mortality/ Morbidity/ Other	Indicator	Data collection		
			Frequency	Source	Method*
Children < 24 mos.	Mortality, all causes	No. of deaths children <24 months.	Monthly	CHW HH visit reports	Routine, all health centres
	Morbidity and mortality of NNT	No. of cases NNT Mortality: cause of death	Quarterly	Clinic records	Routine, all health centres Verbal autopsy for cause
Children <5 yrs.	Morbidity, all immunizable diseases	No. of cases by disease, age, sex, location	Monthly	Clinic records	Sentinel, 6 health centres
Pregnant women	Mortality	No. of deaths, all causes Cause of death	Quarterly	Clinic, CHW & TBA reports	Routine, all centres Verbal autopsy for cause

* Routine, Sentinel, Sample survey/special study, Case/outbreak investigation, Verbal autopsy

between perinatal (died at birth), neonatal (died within the first 28 days of life), and post-neonatal (died between the 29th and 365th day of life). The total of these, of course, is infant mortality.

Investigating cause of death. If you want to determine the **cause** of death, in addition to keeping track of the **number** of deaths, then you will probably need to conduct in-depth interviews to gather the needed information. If you are able to get reliable autopsy reports, by all means use those. If not, you can try the "verbal autopsy" approach. Appendix E describes how to do this and includes prototype questionnaires that you can use.

Before you make your final decision on this question, however, look at the following chart. It summarises the causes of death that you are likely to be able to determine through verbal autopsies. In general, the causes of some deaths are fairly easy to assess, others are more difficult. For example, if a child dies in an automobile accident, from a fall, or is electrocuted, the cause is usually obvious to witnesses.



On the other hand, all but the most obvious causes of neonatal deaths are very difficult to determine. The majority of neonatal deaths are classified as "unknown." See Appendix D for a more detailed discussion of the feasibility of ascertaining the cause of childhood and maternal death.

Table 3: Causes of death that can be determined through interview

	Childhood mortality	Maternal mortality
Relatively easy	Injury Neonatal tetanus Measles Diarrhoea Acute respiratory infection Malnutrition	Post-partum haemorrhage Obstructed labour Eclampsia Post-partum infection Abortion-related
Relatively difficult	Neonatal sepsis	

Morbidity. Repeat these steps to list the diseases that you will monitor for each target group. Again, some are likely to be more important than others to you. Keep your surveillance objectives (Worksheet 1) in mind as you select your priorities. Use Table 2 checklist of common diseases to identify the ones you want to include in your surveillance system.

See Appendix B for more information on several of these, including standard case definitions, lay definitions, and indicators.

Investigating cause of morbidity. As with mortality, if you plan to investigate the cause of one or more of these diseases, you may have to conduct in-depth interviews to get the information you need. In most cases it is unrealistic to investigate more than a few cases each year. You may want to take a selective approach to this issue and determine on a case-by-case basis if an investigation is warranted. Obviously, if most of your children have been fully immunized and there is an outbreak of polio, you would want to investigate that immediately. Thus, you might limit investigations of causation to significant and unusual events. That could come as a result of the outcomes of steps 6 and 7, when you analyse your data and decide whether you need to take action.



How much information is needed? In addition to a count of each case, you may want to collect other information, such as age, gender, immunization status, whether prescribed PHC treatment was provided, and so forth. We strongly recommend that you only collect as much information as you will use. This means:

- **Routine reporting** should be limited to: a) the total number of cases of death or disease in each priority category; and b) their distribution by gender, age group, residence, date of occurrence, and, depending on local conditions, the cause(s) of infant and maternal deaths.
- **Sentinel sites** should report all of the above in addition to information on immunization status for immunizable diseases, on index cases, and on contributing factors. Maternal and infant deaths should be systematically investigated by detailed verbal autopsies.

Routine reporting of age and gender is not superfluous information. There is mounting evidence of mortality differences between boys and girls, and this should be monitored. Age at death is important for maternal as well as infant mortality.

Indicators. At this point you can specify the indicator for each item that you want to monitor. If you went through Module 1, you may already have a tentative list that you can examine. Or turn to Appendix B for a list of common indicators for several of the diseases and health problems mentioned above. Finally, you can consult Module 5: Monitoring and evaluating programmes, which contains a complete set of morbidity, mortality, disability and fertility indicators.

An important decision that you need to make is whether or not to calculate mortality and morbidity **rates** and **ratios**. Unless you have a large population base, you probably will not have enough cases to do this. A rough rule of thumb is that you will need to have a population of at least 50,000 to identify enough infant deaths to compute a reasonable infant mortality rate. Since maternal mortality is far less common, you would need a population about ten times larger. You also need to collect data from the entire population. You



**Specify
indicators**

cannot use a sentinel system. Thus, you must have a very good recording and reporting system that identifies every infant and maternal death. That is difficult to find in most developing countries.

The other approach is to collect the required data through sample surveys. Module 2 describes how to do this, and the sample size requirements, which are still large. In general, you would need a sample of about 2,000 **respondents** (not population) for infant mortality, and 7,000 for maternal mortality. The data collection procedures are relatively simple, and Module 2 includes sample questionnaires that you can use. However, the computation and analysis procedures are difficult, especially for maternal mortality estimates. The advice from Module 2 is to consult a trained demographer if you want to measure mortality rates or ratios. See Appendix G.5 in Module 2 for a fuller discussion.

Finally, don't forget that you can also monitor coverage, fertility, disability and other non-mortality/morbidity items. If you plan to do that, consult Module 5 for extensive lists of indicators that you can adapt to your system.

Step 3: Select the methods and procedures

In this step you will select the data collection procedures for each of the indicators. Basically, that means that you will decide whether to gather the data from routine reports, set up a sentinel system, or conduct special surveys to collect the data. The advantages and disadvantages of these approaches were described in the Introduction. If you are not sure which approach to select, you may want to read this section again.

Keep in mind that you can select more than one procedure. You could collect most of your data through routine records and set up a sentinel system for a few additional indicators. Also, keep in mind that you can change the procedures at any time. You can add indicators, drop some, switch to rapid surveys to collect data on an annual basis, and so forth.

Fill in the second part of the last worksheet (Worksheet 2), which asks you to indicate: 1) the frequency of reporting; 2) the source of the data for the indicator; and 3) the data collection method for each indicator. As the example shows, most of the data will be reported monthly, and some quar-



terly. The sources are largely routine reports from CHWs and the health centres. And the methods will rely largely on routine reporting, supplemented by a surveillance system in six health centres and verbal autopsies to determine the cause of each maternal and infant death.

Surveillance procedures

Frequency of data collection/reporting. For the majority of indicators of a **routine** system, the frequency of data tabulation and reporting is **monthly**. However, for high priority indicators, such as a case of polio in a fully covered area, the reporting of cases should be weekly, or instantly so that action can be taken immediately.

Sentinel sites usually report **weekly** so that outbreaks can be detected quickly. For unusual or significant events, the reports should be immediate.

Sources. Data are either already available or not. If they are available, they are called **secondary** sources, which include all kinds of reports and records. If they are not available, they have to be collected especially for surveillance, and are called **primary** sources, which include observations and interviews. The most common sources for surveillance systems are listed below, using a CHW as an example of the data collection agent:

The sources of data are always people, originally. Thus, you can substitute "laboratory technician," or "doctor" for CHW and you will quickly see that there are many potential sources of data for surveillance. In PHC programmes these

Direct observation	Direct reports	Records and reports
Unstructured: CHW happens to see event	Free association: CHW overhears discussion	Statistical: CHW keeps track of cases
Structured: CHW uses checklist to observe	Unstructured interview: CHW talks to mother	Documents: CHW prepares monthly report
	Semi-structured interview: CHW uses checklist to talk to mother	Secondary reports: CHW reads laboratory reports
	Structured interviews: CHW conducts formal interview	
	Tests: CHW examines child	
	Inventories: CHW counts EPI supplies	



people might be clients, health workers, or non-health workers — school teachers, community leaders, university researchers. The main sources of surveillance data will usually be health workers: outreach, health centre staff, and health providers in other parts of the community, hospitals, maternity clinics, private midwives and doctors, etc. Typically, the health workers observe, interview, and then record data about morbidity and mortality. They do not always report this information. If you are setting up your own system, don't rely exclusively on available reporting systems, such as health centre and hospital activity reports. There may be a better way to get information quickly and easily, even if it means setting up a new systems for a while. See Module 5, Monitoring and evaluating programmes for some suggestions.

Methods. The introduction described six of the most common methods for collecting surveillance data. Although this module emphasises two of them, routine and sentinel reporting systems, the others are also listed to remind you that there are other options.

You will need to consider your selections carefully, especially if you are going to set up a new sentinel reporting system. This can be expensive and time-consuming, especially if the reporting requirements are large. However, if you can keep it small and focused on the data you need most, it can be invaluable to you.

You should complete the last part of Worksheet 2, then review your overall design, consolidate or revise it as you

Surveillance methods	Description
Routine reporting systems	Information is routinely collected and reported by PHC staff
Sentinel reporting systems	A small number of reporting units (usually health centres or hospitals) carefully collect and report requested data
Surveys & special studies	Usually sample surveys to estimate the level of a disease or condition in a given area
Case/outbreak investigations	Special investigations of one or more cases of a disease or death to determine its cause and recommend action to prevent its recurrence
Vital registration systems	Public and private health providers report births, deaths and other selected data to a central system.
Census	A count of all of a population, often including questions about health habits, diseases, etc.



think necessary, and then move on to designing data collection procedures.

Step 4: Develop the data collection and reporting procedures

Once the surveillance procedures have been selected, you can begin to design your data collection procedures. This consists of three sub-steps:

- Develop operational definitions of cases
- Develop or revise the data collection/recording instruments
- Pretest the instruments

Develop an operational definition of a case

A "case" is defined as an individual situation or occurrence. In health, a case is usually an individual person who has a particular disease. Thus, a person who comes to a clinic complaining of severe diarrhoea is a case. A child suffering from 3rd degree malnutrition is a case. An important surveillance requirement is to be able to define each case that is identified. A mother may bring a child in for examination, not knowing what is wrong. The health worker must diagnose that child's condition so that it can be treated properly, but also so that the health problem can be accurately identified, recorded and reported.

Appendix B contains a listing of common diseases together with their standard and "lay" (non-clinical) definitions. Two examples are shown below.

Disease	Standard case definition	Lay definition
Measles	History of a generalized maculo-papular rash lasting three or more days and history of any one of the following: cough, coryza, conjunctivitis.	History of fever and rash and any one of the following: cough, running nose, red eyes
Diphtheria	Acute pharyngitis, acute nasopharyngitis, or acute laryngitis, with a pseudo membrane	Sore throat, with grey patch or patches in the throat

You need to have a case definition for every disease that you plan to monitor. This is necessary to ensure that all health workers use the same definitions and criteria to diagnose a specific disease. Otherwise, the surveillance system will be of no use.



You can use the WHO definitions in Appendix B as a start. There may be variations in your area that require a slightly different definition. Contact your local epidemiology or communicable disease control centre to get the standard definitions used in your country.

There are a few important rules to convey to your staff about identifying and recording cases:

- **Avoid double-counting.** If a child makes two visits to a health centre for the same disease episode, count it as one case only.
- **Only count those cases that have been diagnosed by a health worker.** Count separately, but do not record or report cases that have been reported by community members, unless they have been diagnosed by health staff. This is necessary to avoid misdiagnosis and double counting.
- **Count current cases only.** You need to set a time frame for including cases. That could be the number of cases that occurred during the past seven days. Then, do not include any cases that occurred eight or more days ago.

Develop/revise data collection/recording instruments

There are three types of instruments that you might use in routine and sentinel surveillance: registers, survey questionnaires, and case investigation protocols.

Registers. The most likely instruments that you will use for routine surveillance are your clinic and outreach registers. If you set up a sentinel system you may want to expand them to include additional data, or you may want to develop a special form to collect additional data on a limited number of diseases.

- **Clinic registers.** All ongoing PHC programmes will already have registers, which can probably be used for surveillance as well as basic record-keeping. If they aren't exactly what you need, you can probably adapt them fairly easily. Module 3, Planning and assessing health worker activities, suggests two clinic registers that can easily be used for surveillance.



- **Individual clinic treatment record.** This form records details of visits made by an individual for routine care as well as for treatment of various diseases. The form, a portion of which is shown in Exhibit 1, can be adapted easily to include whatever disease you are interested in monitoring. A separate record can be used to tabulate entries from individual forms. This form is useful if you want to include special characteristics of each case, such as age, sex, marital status, etc.
- **Daily clinical treatment record.** This form is used to record all visits made to a facility each day (Exhibit 2). In addition to identifying all cases seen during the day, you can also record the individual's sex and age group. Daily totals can easily be summarised each week or month.
- **Outreach registers.** Module 3 also describes and illustrates an **outreach activity register** that can also be used for surveillance (see Exhibit 3). This two-page form is used by each CHW to record the results of monthly visits that are made to each household in the CHW's work area. This form is designed to collect data on births, deaths, immunization, diarrhoea and nutritional status of all children under age five, and the pregnancy and immunization status of all married women in the household. The form can be adapted easily to collect other information needed for surveillance, including morbidity history, current health problems, and even cause of death.



Exhibit 1: Excerpt from Module 3 – Individual clinical treatment record

Household #: 1146		Individual #: 238		Medical record #A-65		For: unregistered only					
Patient name: Rosa Sanchez				Date of birth 28/11/53							
Father/Husband name: Pedro				Sex (M/F) F							
	VISIT DATE	18/9	17/10	15/11							
	Routine antenatal care	✓	✓	✓							
	Routine well-baby care										
1	Tuberculosis										
2	Polio										
3	Diphth/Pertus/Tetanus										
4	Measles										
5	Mumps										
	Other diseases										
6	Malnutrition										
7	Diarrhoea/Dysentery										
8	Intestinal parasites										

Exhibit 2: Excerpt from Module 3 – Daily clinical treatment record

Name of clinic Mt. Vernon		Date: 28, Nov, 1992				MO/CHN: Pamela						
		Registered										
		1	2	3	4	5	6	7	8	9	10	Total
	Household no./Reg. no.	146	128	62	243	416	24	518	661	84		
	ID #	238	216	45	306	610	47	618	721	96		M=4
	Sex: M/F	F	M	M	M	F	F	M	F	F		F=5
	Age: Years <1			✓				✓				2
	1-5		✓			✓			✓			3
	6-14											
	15-49	✓					✓			✓		3
	Over 49				✓							1
	Routine ANC	✓					✓			✓		3
	Routine well-baby			✓		✓		✓				3
1	Tuberculosis											
2	Polio											
3	Diphth/Pertus/Tetanus											
4	Measles		✓			✓			✓			3
5	Mumps											
	Other diseases				✓							1
6	Malnutrition											
7	Diarrhoea/Dysentery											
8	Intestinal parasites			✓		✓						2



Exhibit 3: CHW Activities register (left side)

			Children <3 years									
Sr. No.	House- hold No.	I.D. No.	Age	Newly identified birth (Jan-Mar)			Jan.		Feb.	March		
				Live DT BW	Still DT	Wt.	Wt.* Ch.	Wt.* Ch.	Wt.* Ch.	Nut. St.**	Imm. St.***(<1)	
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
01	242	C5	2.1				10.5	-	O	O	N	C
02	243	C2	2.7				8.3	+	-	O	I	C
		C3	NB	12/3	2.4						I	IC
03	244	C6	2.1				11.2	+	+	NW	N	IC
04	245	C2	1.8				10.4	-	-	-	N	IC
		C3	0.8				8.2	+	0	-	N	A
05	246	C4	2.9				10.1	-	-	0	I	C
		C5	1.8				8.3	+	+	+	I	C
06	247	C1	2.6				8.5	+		-	II	C
07	248	C4	2.1				7.6	-	0	0	II	IC
		C5	1.1				8.0	+	0	0	I	IC
		C6	0.2				3.4	+	+	0	I	N
Total	x	x	12		1			+ = 7 O = 0 - = 4 NW = 0	+ = 3 O = 4 - = 3 NW = 0	+ = 1 O = 6 - = 3 NW = 1	N = 4 I = 6 II = 2 III = 0	C = 5 A = 1 IC = 5 N = 1

*** WEIGHT CHANGE**

+ = Increase in weight
 O = Same weight
 - = Decrease in weight
 BW = Birth weight
 LBW = Low birth weight
 NB = Newborn

**** NUTRITION STATUS**

N = Normal
 I = First degree malnourished
 II = Second degree malnourished
 III = Third degree malnourished
 NW = Not weighed



Exhibit 3: CHW Activities register (right side)

Date of visits			Deaths	Married women							
Jan.	Feb.	Mar.	Jan-Mar.	Jan.	Feb.	March		***Imm. sta.		ID#	Number of family members
			ID#	PR	PR	FP	PR	All	DLVD.		
(11) 12/1	(12) 15/2	(13) 18/3	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
								C		M	6
12/1	14/2	18/3	D 25/12	7	8			C	C	M	8
13/1	14/2	12/3						IC		M	3
13/1	14/2	12/3		4	5		6	C		M	5
10/1	12/2	13/3						IC		M	6
10/1		13/3						IC		M	3
10/1	13/2	13/3			4			IC		M	5
7	6	7	1	2	3		1	C=3 IC=5 N=0	C=1 IC=0 N=0	8	36

*** IMMUNIZATION STATUS

C = Complete

D = Divorced

IC = Incomplete for age

A = Appropriate for age

N = No immunization

PR = Pregnancy month of pregnant woman

DLVD = Women who have delivered during the quarter

FP = Family planning

DT = Date

M = Married

- **Death report.** If you don't already have one, you can supplement the clinic and outreach register with a simple "cause of death" form. Exhibit 4 is an example. One of these forms would be filled out for each death identified during the reporting period. The results can then be tabulated at the end of the reporting period.

Survey questionnaires. Module 2, Assessing community health needs, includes three instruments that you can use if you plan to conduct surveillance through sample surveys.

- The first is a **Vital events and health status** questionnaire. It allows you to measure the recent morbidity and mortality status of every person in a selected household.



Exhibit 4: Death report

Cause of death	
Name: <i>Conchita Juarez</i>	Sex: <i>F</i>
Address: <i>House # 146, Mt. Vernon</i>	Date of birth: <i>12 Oct. 1991</i>
	Date of death: <i>14 Nov. 1992</i>
	Age at death: <i>13 months</i>
Cause(s) of death: = main 1. <i>Measles*</i> 2. 3. 4.	Supporting <i>CHW observed rash</i>
* Comments: Child had not been immunized against measles	
Signed: <i>Pamela Jones</i>	Today's date: <i>16 Nov, 1992</i>

- The second is a **Child mortality** questionnaire, designed specifically to collect data on mortality of children under age one, between ages two to four, and under age five.
- The third is a **Maternal mortality** questionnaire.

You can adapt each of these questionnaires to suit your programme's needs and the diseases you want to monitor. Exhibit 5 is an excerpt from the morbidity section of the vital events questionnaire.

Case investigation. The current module includes two prototype instruments that you can use to do in-depth investigations of the causes of a disease, health problem or death.

- **Case investigation form.** Appendix C contains a protocol for investigating a case of neonatal tetanus.
- **Verbal autopsy form.** Appendix E contains two detailed protocols, one for investigating the cause of a child death, the other for a maternal death.

Pretest the instruments

After you have selected (or developed) your instruments, you should pretest them under real conditions. That is, try them out in your programme to see if they are understandable to your staff, easy to use, and produce the type of data you need.



Exhibit 5: Excerpt from Module 2 – Vital events and health status

Morbidity

14. Is there anyone in your household who has been sick this week?

Yes ☒ (1) No ☐ (0) Go to Q.60 DK/NR ☐ (9) Go to Q.60

Who is/are sick (probe and fill out following table, using SI. No., e.g., 7.3, 9.2):

15		16	17	18	19	20	21
SI	Name	Age m/y	Sex M/F	Disease (Code) 01, 02, etc	Treated Y/N	Where Treated 1,2,3, etc.	Outcome 1,2,3, etc
2	Pasquel	8/0	M	01	Y	5	2

If more than one illness, code starting with 25, 35, 45, etc.

18. Disease Code:

01	Diarrhoea/Dysentery	08	Polio
02	Anaemia	09	Tuberculosis
03	Scabies	10	Acute respiratory inf.
04	Diphtheria	11	Fever
05	Whooping cough	12	Malaria
06	Tetanus	13	Other: _____
07	Measles	99	DK/NR

20. Where Treated

1	Government clinic/hospital
2	Mobile clinic
3	Private clinic/hospital
4	Private doctor
5	Private midwife/nurse
6	Traditional practitioner
7	Pharmacy/drug store
8	Other: _____

21. Outcome

1	Cured/Recovered
2	Still recovering
3	Permanent disable
4	Died
5	Other:
9	DK/NR

Step 5: Collect and report the data

Training, supervision and quality control

Once you have your procedures and instruments, you can start your surveillance. Good training and supervision of your staff in data collection, tabulation, and reporting will be crucial to the success of the system. Anyone who is involved in any of these functions should be trained. That includes community volunteers, TBAs, school teachers, as well as CHWs and health centre staff.

Training should cover the following topics:

- the purpose and utility of surveillance
- how to recognize and classify specified diseases using



standard or lay case definitions

- how to record data on the clinic and outreach registers
- how to summarise and report the data on a weekly or monthly basis
- how to determine if further investigation is needed.

Case investigations, including verbal autopsies, require special attention. One consideration is the number of investigators you need. If there will be few investigations, it may be best to train a few people and let them handle all of the investigations. But if there are likely to be many investigations, and if they are likely to be spread out over a wide geographic area, it may be better to train a larger number of people who are assigned to different areas.

Investigations are not easy to conduct, and the people chosen to do this must have a certain amount of persistence and dedication to their task. It is natural for PHC staff to dislike asking intimate questions, and a common problem is that they avoid some or all of the required questions. Some ways to deal with this are: 1) make sure the interviewers are well trained to begin with; 2) watch them during practice sessions to see if they have the tenacity to go after the needed information; 3) make sure that there is enough time allocated to allow the interviewer to get to and from the site, establish rapport, and probe for answers; 4) encourage the investigators to express their concerns and feelings, and help them to deal with them; 5) emphasise the importance of their task for the health and well-being of others; 6) teach them culturally appropriate ways to obtain the information; and 7) accompany them periodically on investigations to observe their technique and provide constructive feedback.

Supervision is important. Make sure that the interviewers follow up on all designated cases and deaths. Don't let them skip some because they are inconvenient. Make sure that they follow up on answers that are not complete, or questions which aren't answered. Encourage them to probe, to go beyond the questionnaire to find out what really happened. Discipline them to write responses down, especially explanations that cannot be recorded easily on the questionnaire. Tell them to use the local language or dialect,

**Train and
encourage
investigators**



**Closely
supervise
investigators**

and to record local words and phrases that are used. These sometimes have subtle meanings, and the differences can be important. Before they terminate an interview, encourage them to summarise what they have recorded and ask for verification.

Quality control is important, also. The best way to ensure quality is to instil the desire for it in the interviewers. Encourage them to examine their own procedures and to identify ways to improve them. Bring the interviewers together as a group to share experiences and to seek solutions to common problems.

Mistakes will still be made, despite all good intentions. In sentinel systems and case investigations, in particular, it is useful to have a second person verify the data. For example, have someone check the entries on the registers and the tabulations. Have a supervisor re-interview five to ten percent of the case investigations, or have the supervisor observe five to ten percent of the case interviews.

**Quality
control
importance**

A sure indicator of problems is a high "unknown" ratio. If more than ten to 20% of the causes of a disease or death are unknown, then it is likely that something is wrong. It could be that the instrument, interview technique, or timing of the interview is causing the bias.

Data collection, tabulation and reporting

If you plan to collect data through a survey, see Module 2 for specific instructions.

Routine and sentinel system data collection will be done daily. You decided in Step 1 the time period and frequency of data collection. You may want to try out your system for a few weeks and then assess whether you need to make any changes. You may also have changed your mind about frequency as you have clarified your procedures. For example, if your CHWs make a routine monthly call to every household, or if they do an annual remapping update, that may be a good time to collect your surveillance data.

Normally your staff would tally data daily on a register and then add up the totals at the end of the day or week. Those summaries can then be compiled at the end of the recording period (usually a month). If there are several health centres (or CHWs) reporting the data, you will probably enter the



totals from each one on a separate register. Exhibit 6 illustrates one way to do that on a routine register.

Sentinel data might be more complex, if additional data on such items as immunization status and other variables are required. But the idea is the same. Just tally the data, compute the totals, and compile the reports from the various units.

Case investigation data is likely to be different. In the first place, there are likely to be few investigations in a given reporting period. Second, the amount of data collected is likely to be much greater. Nevertheless, summary reports can be prepared in the same way. Exhibit 6 could be modified, for example, to report the total number of deaths in the period, by sex and age group. A list of causes of death could be substituted for the diseases listed in the left column.

**Customize and
update proce-
dures**

Step 6: Analyse the data

Analysis should be encouraged at each level of the surveillance system. If CHWs learn to interpret the data they are collecting they will have a better understanding of the needs of their communities. Health centre staff should also be encouraged to analyse their data.

Surveillance data can be easily tabulated in three ways: summary tables, disease charts, and maps.

Summary tables

Most tables will be made up of simple **counts** of the numbers of cases. Some tables may include **percentage** distributions, and a few might include **averages**. Table 4 illustrates a table of counts. This is a summary of the data from Exhibit 6 on measles and diarrhoea.

Disease charts

You can also construct charts from these tables. Figure 2 is a chart drawn from the data in the table above. Note how the high number of measles cases in two health centres is immediately noticeable in a bar chart. One of the values of charts is that patterns and trends can be seen quickly. Appendix A contains a number of "templates," which are pre-formatted tables on computer files. If you use these, you simply enter the basic data (counts of cases) and the computer automatically computes the totals, percentages (where ap-



Exhibit 6: Summary of data from ten health centres

Excerpt from a modified daily clinical treatment record

Programme: Mt. Vernon PHC					Date: 30 Nov, 1992									
Health centres														
		1	2	3	4	5	6	7	8	9	10		Tot.	
	Sex: Male	41	25	42	75	43	38	42	32	44	27		409	
	Female	40	36	52	61	40	40	43	43	55	24		434	
	Age: Years <1	8	10	5	12	8	6	9	16	16	12		102	
	1-4	64	39	73	108	57	57	62	33	58	21		572	
	5-14	3	2	5	3	5	7	8	4	2	3		42	
	15-49	4	6	8	7	8	4	6	16	21	12		92	
	Over 49	2	4	3	6	5	4		6	2	3		35	
	Routine ANC	3	4	6	5	8	2	4	5	5	4		46	
	Routine well-baby	6	8	5	12	6	4	8	14	16	10		89	
1	Tuberculosis													
2	Polio										1		1	
3	Diphtheria/ Pertussis/TT													
4	Measles	1		2			1			18	12		34	
5	Mumps		1										1	
	Other diseases	2	6	4	3	8	10	7	9	2	4		55	
6	Malnutrition													
7	Diarrhoea/ Dysentery	2	6	14	2		3	8	1	10	8		54	
8	Intestinal parasites													

propriate), and averages (also, where appropriate). The computer will also construct a graph of your data for you. If you change any figures, the calculations and graphs will change automatically.

Summary disease charts are also useful. They are usually made for a 12-month period, as shown in Figure 3. This chart presents data from one health centre. Similar charts can be prepared for all health centres combined. That is, the total number of cases for all ten health centres would be entered each month.

Long-term trend data are easier to visualise in a line chart, as illustrated in Figure 4. As will be discussed later, this type of chart is especially useful for identifying seasonal and epidemic patterns.



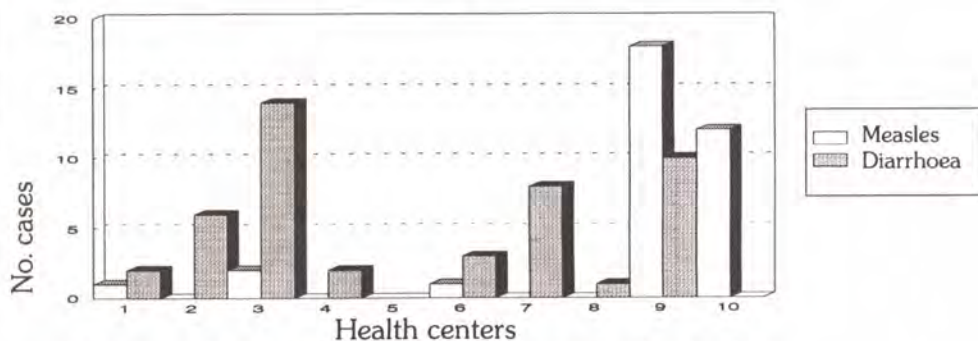
Table 4: Measles and diarrhoea cases reported, December, 1992

Health centre:	1	2	3	4	5	6	7	8	9	10	Total
Measles	1		2			1			18	12	34
Diarrhoea	2	6	14	2		3	8	1	10	8	54
Total	3	6	16	2	0	4	8	1	28	20	88

Maps

Mapping is described in detail in Module 3: Work planning. The advantage of a visual presentation of the geographical distribution of cases is that it is easier to identify the location of cases. That can often give you a quick picture of how communicable diseases are spreading. You may see diarrhoea cases clustered in one area, STDs spread along transportation routes and other diseases limited to urban areas.

Many PHC programmes now use maps for planning and those same maps can be used to identify households with a disease or health problem. If you plan to monitor several diseases, you can use different coloured pins or symbols to indicate each disease.

Figure 2: Measles and diarrhoea cases, December, 1992

Maps are also useful at higher administrative levels. For example, you might show the number of cases of malaria in each village, town, or district. Figure 5, malaria in this example, illustrates how data on the progression of a disease, malaria in this example, might be monitored.

Charts and maps are powerful visual aids. But you can usually show only a few diseases on each chart, otherwise they become too cluttered and difficult to understand. Thus,



you should be selective in developing charts and maps. You could easily develop 50 charts for just five diseases reported from ten health centres.

Figure 3: Measles cases, Mt. Vernon Health Centre, 1992

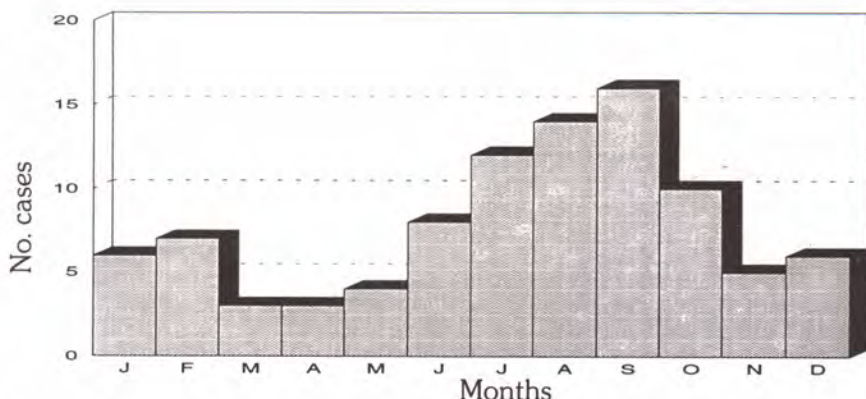


Figure 4: Measles cases, Mt. Vernon Health Centre, 1990-1992

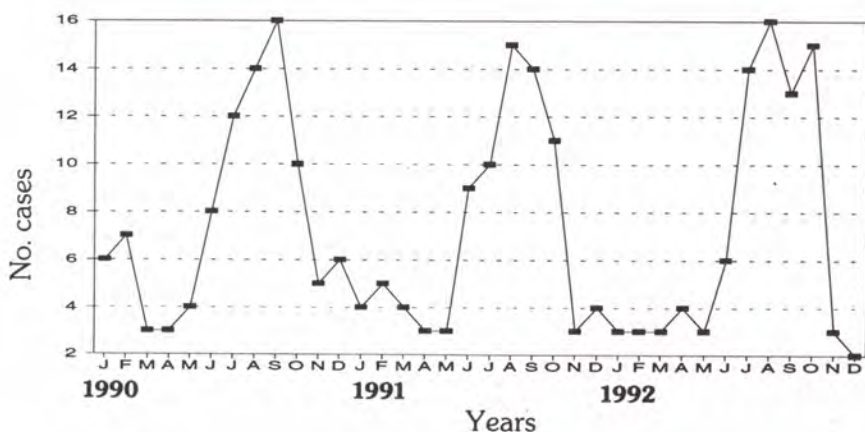
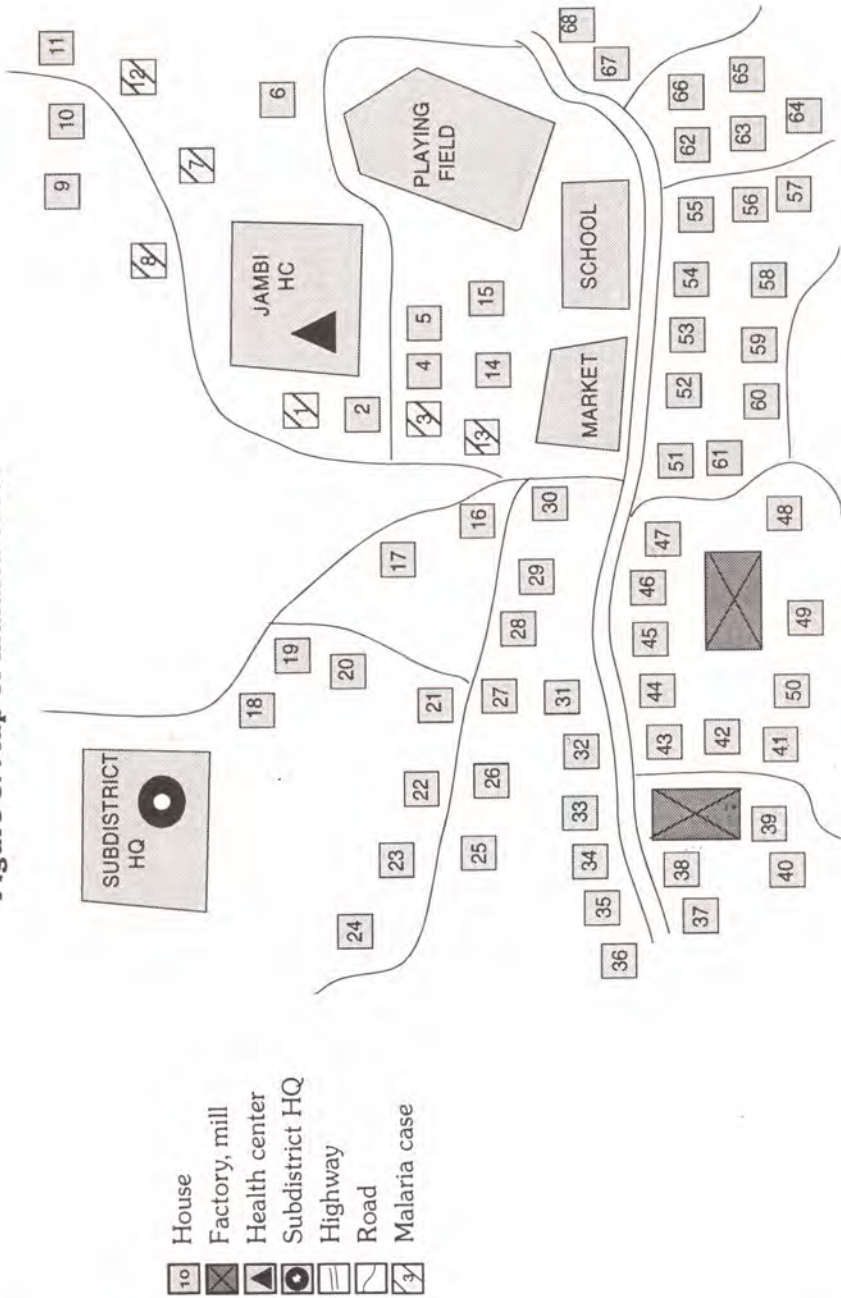


Figure 5: Map of malaria cases



Computing rates and ratios

Most programme managers will not (or should not) calculate rates and ratios unless their target population is large enough to produce reasonably accurate figures. You should be especially cautious about computing mortality rates. As we mentioned in Step 2, a rough rule of thumb is that you will need to have a population of at least 50,000 to identify enough infant deaths to compute a reasonable infant mortality rate. You would need a population ten times that size to compute a maternal mortality rate. Module 2 shows how to estimate the population size needed to identify a particular "attribute" (such as the proportion of children under age two who are malnourished). The recommendation from Module 2 is to consult an expert for advice on whether you can (or should) calculate rates and ratios.

If your population is large enough, then you should compute these rates and ratios. The most typical of these are defined and illustrated below:

- **Incidence rate.** The number of **new** events that occur in a population in a given period of time divided by the total number of persons exposed to risk during that same period;

$$\frac{\text{No. new TB cases last month}}{\text{Total population}} \times 10^n = \frac{13 \times 100,000}{850,000} = 1.53$$

This is usually expressed as 1.53 per 100,000 population;

- **Attack rate.** A cumulative incidence rate that is observed for a limited period, like an epidemic. The formula is the same as the incidence rate formula;
- **Prevalence rate.** The total number of **all** individuals who have an attribute or disease at a particular point (or period) in time divided by the population at risk. The following example is for May, 1992. The rate would be expressed as 156 cases per 100,000 population in May, 1992;

$$\frac{\text{Total no. TB cases now}}{\text{Total population}} \times 10^n = \frac{1325 \times 100,000}{850,000} = 155.9$$



Appendix B includes appropriate rates for each common disease that you are likely to include in your surveillance system. You can also consult Module 5, which includes lists of morbidity and mortality indicators that you could use.

Analysis

The purpose of analysis is to: 1) identify patterns, and 2) if possible, causes of diseases or deaths.

Look for the following patterns in your data:

- **Spikes:** Unusual or sharp increases or decreases in the number of cases. This can indicate an outbreak of a disease, perhaps due to an unexpected general problem, such as the introduction of a new strain of flu.
- **Clusters:** Groupings of cases by time period, area, age group, etc. This can indicate an outbreak that is limited to a certain part of the population, such as an outbreak of cholera in a specific part of a city.
- **Trends:** Gradual increases or decreases in cases over time. You need to watch trends carefully, since they may occur so gradually that change is not obvious. Examples could be increases in tuberculosis cases, or decreases in anaemia.
- **Systematic variations:** Regular changes, such as seasonal variations in diseases. Measles, for example, varies seasonally. A sudden spike might be natural.

Surveillance systems are sensitive to the number of reported cases

If you are running a **sentinel system**, you are likely to have more data, which will enable you to do more detailed analyses. The most typical is a correlation. For example, you might examine disease patterns by age group, by sex, by age and sex, by parity, by site, and so forth. This is the same type of analysis described in Module 2 as "cross-tabulations." If you are planning to use a computer to analyse your data, try the *Epi Info* programme that comes with Module 2. It was designed for surveillance.

Changes in disease patterns may indicate an improvement in health, if the trend is down, or a deterioration, if the trend is up. But the changes could also reflect better or worse surveillance, rather than a real change in health status.

Surveillance systems are very sensitive to the number of reported cases. Ideally, all cases would be identified and



reported. But if they are not, then your figures will **underestimate** the actual level of disease. On the other hand, if more cases are reported than actually occurred, then you will **overestimate** the threat.

There are four major factors that can influence the number of cases that are reported.

- completeness of reporting
 - seasonal variation
 - epidemics or outbreaks
 - coverage
- **Completeness of reporting:** Surveillance reports may change for two major reasons. First, people may use the health centre more, and as a result, more diseases would be recorded. Second, health workers may improve their case-finding skills and identify more diseases than before. Thus, an apparent increase in diseases may actually just be an increase in reporting. The opposite can occur as well, of course. If neither of these factors has changed between reporting periods, you can be more confident that a change in the data will reflect a real change in cases.
 - **Seasonal variation:** Some diseases vary with seasons. Measles, malaria and Guinea worm, for example, vary with the seasons. When coverage, e.g., malaria prevention and control, increases, the seasonal variation will be less noticeable. Seasonal outbreaks vary from one area to another, however, and you may need to chart your own experience for several years to identify seasonal variations.
 - **Epidemics:** Some diseases reach epidemic levels every few years. Incidence may be relatively steady for several years and then increase dramatically. Measles can be like this. Epidemic patterns also vary from one area to another, and they also have to be charted to identify the patterns.
 - **Coverage:** As your target population becomes protected from a particular disease or health problem, the incidence should decline. As more women get enrolled in ANC and have safe deliveries, the incidence of childbearing problems should decline. This is the one change that you would hope to see.



- **Other factors:** If your target population is changing due to in or out-migration, you could see significant changes in disease patterns. In some central cities slum populations increase 10-15% annually, which can have a significant negative effect on overall health status. Even if coverage is high, diseases can still spread if the health intervention is ineffective. For example, a breakdown in the cold chain can destroy the efficacy of vaccines. You may also see changes in health status due to a general improvement (or deterioration) in socio-economic status, due to an increase (or decrease) in the availability of other health services, or of food, clothing and shelter. Natural disasters, floods, earthquakes, volcanic eruptions, fires can bring about tremendous changes in health.
- **Analysis of differences due to age, sex, education, income and other factors:** Although you are not likely to turn your surveillance activities into a research programme, you may want to examine some factors every once in awhile to see if there are any subgroups that are more affected by a particular disease. For example, you might compare disease and mortality patterns of infant boys and girls. If mortality is higher among one group, there is an obvious need to direct more attention to that group.
You may also want to examine changes over time. For example, if you compare ARI cases for several years, you may notice a shift in the age groups affected by the disease.

Step 7: Investigate causation (optional)

You may want to determine the cause of certain diseases, health problems or deaths. As noted previously, this requires special training and in-depth investigation. For most PHC programmes, including those with sentinel surveillance systems, investigation of causation will probably be done on a selective basis.

Case and outbreak investigations

Appendix C contains a prototype form for investigating a case of neonatal tetanus. You can modify this form to apply to other diseases.

You will need one form for each case selected for inves-



tigation. Then follow these general guidelines for conducting the investigation:

- Observe or examine the patient, if possible
- Interview the mother or other relative who has first-hand knowledge of the case
- Interview the health worker who examined, observed or treated the case
- Collect basic descriptive information about the case
- Confirm the diagnosis
- Identify symptoms the patient had before and during the illness
- Determine whether the patient had received appropriate preventive care
- Identify the treatment the patient received during the illness
- Identify the outcome of the treatment and illness

Analyse the information that is collected to identify: 1) the main cause of the disease or problem; and 2) action that could be taken in the future to prevent a recurrence of the disease.

Verbal autopsies

Appendix D provides important information and guidelines on ascertaining the cause of death. Appendix E contains two verbal autopsy protocols, one for child, and the other for maternal death investigations.

The procedures for using the verbal autopsies are similar, but not identical, to those for case and outbreak investigations.

- Observe or examine the body, if possible
- Interview the mother or other relative who has first-hand knowledge of the death
- Interview the health worker who examined, observed or treated the deceased (prior to, during, or after the death)
- Collect basic descriptive information about the death circumstances of the death, symptoms and condition of the person at time of death suspected causes (diarrhoea, ARI, injury, etc.)
- Complete the coding chart



- Identify the main (most probable) cause of death
- Identify associated causes
- Determine whether the patient had received appropriate preventive care
- Identify the treatment the patient received during the illness

As with case/outbreak investigations, the analysis should identify: 1) the main cause of the death; and 2) action that could be taken in the future to prevent this type of death.

Verbal autopsy data can be cumulated, as well. That is, the results of several investigations can be summarised, as in Table 5. This example shows the results of verbal autopsies of 61 children. Diarrhoea was the main cause of death for 40, and ARI for 21. Of those who died from diarrhoea, 20 had non-associated causes, 12 had ARI, eight were malnourished, three had measles and ten had a low birthweight.

For more information about ascertaining cause of death and analysing the results, see Appendices D and E.

**Analyse
information
collected**

Step 8: Develop an action plan

Obviously, the whole purpose of surveillance is to find ways to prevent unnecessary disease and death. The data you collect through your system will help you do that. Once you have identified problems, and then determined their causes, the next step is to do something to eliminate those problems.

In many cases the actions that are needed will be obvious. For example, if many women are having pregnancy complications because they are not getting adequate care, then they need to be enrolled in ANC. In other cases the solutions aren't going to be obvious. For instance, diarrhoea may continue to be a problem even though most mothers know how to prevent and treat it. In this case you may need to gather more specific information on the cause of the problem before you can recommend a solution.

In either case, you will need to take action. In addition to the suggestions in this module, Module 6: Service quality, can help you do a more in-depth assessment of problem PHC services.

The Problem-solving guide will also provide you with



Table 5: Main and associated causes of death of 61 infants

Main cause	No. cases	none	ARI	diarrhoea	malnutrition	measles	low birthweight
Diarrhoea	40	20	12		8	3	10
ARI	21	11		8	3	4	5
Total	61	31	12	8	11	7	15

some ideas. If you are still uncertain, this may be a good time to conduct a brainstorming session with your staff, community representatives, and others to identify the root cause of the problem and to search for solutions. If you have a viable solution, or even if you don't, but want to develop one, then outline a plan of action. The plan does not have to be detailed, but it should include:

What: The action(s) to be taken should be specified, e.g., provide ANC training to TBAs, or brainstorm what can be done to enrol high-risk women in ANC.

Who: The specific people who will be responsible for each action should be identified, by name or position.

When: The dates for starting and/or completing the actions.

In some cases it may be important to include **where**, to specify the sites or locations where the actions will take place, **how**, to outline the procedures that will be followed, and the **resources** that will be made available to carry out the actions.

**Actions needed
will often be
obvious**

Specific details may need to be worked out later, and even some of the above elements may have to wait until the formal report is ready and can be studied more carefully. If so, then they should be incorporated into the preliminary action plan.

Step 9: Prepare and present reports

Most surveillance systems are designed at the central level and require reports to be sent to that level for analysis and interpretation. This module has proposed a local surveillance system, where the reports should address the concerns of local PHC managers. However, the data generated by this system should be useful to other levels as well.

If you are going to make formal reports to other levels, then the following guidelines may be of some help to you.



- Review your original objectives (see Worksheet 1) to make sure that you know the user's most important objectives, questions, issues, and indicators. Make sure that your report addresses them.
- Review your tables, charts, and maps. Decide which ones will provide the users with the information that most interest them. Add a short narrative to explain each one.

WORKSHEET 3: DEVELOP ACTION PLANS

ACTION TO TAKE (What)	RESPONSIBLE (Who)	DATES (When)	OTHER (Where, How, Resources)
Identify all 3rd degree malnourished children <3 years of age	All CHWs and HC staff	June	Via HH visits and routine clinic services

Order them in some logical sequence, such as the following;

The number of cases of each disease

The number of deaths, by cause

An analysis of trends, what they mean

Major issues that need to be addressed

A summary of the actions that you have (or plan to) take.

It is also a good idea to keep a record of your reports, and to supplement your official reports with more frequent (perhaps monthly) internal reports, actions taken, and results observed. Documenting the actions that you have taken to deal with a problem is invaluable information. It can help you — and others — avoid mistakes in the future, and most important, replicate those actions that really work.



Appendix A: Blank worksheets and analysis templates

A.1: PLANNING, REPORTING WORKSHEETS

WORKSHEET 1: SPECIFY THE OBJECTIVES OF SURVEILLANCE

Purpose(s)

- | | | |
|--|---|---|
| <input type="checkbox"/> Assess needs | <input type="checkbox"/> Monitor trends | <input type="checkbox"/> Explain causes |
| <input type="checkbox"/> Identify risk factors | <input type="checkbox"/> Evaluate impact on _____ | |
| <input type="checkbox"/> Identify outbreaks | <input type="checkbox"/> Other: _____ | |
| <input type="checkbox"/> Identify unusual events | <input type="checkbox"/> Other: _____ | |

User(s)

- | | | |
|---|---------------------------------------|------------------------------------|
| <input type="checkbox"/> Board of directors | <input type="checkbox"/> PHC Manager | <input type="checkbox"/> Community |
| <input type="checkbox"/> Government officials | <input type="checkbox"/> PHC Staff | <input type="checkbox"/> CDC* |
| <input type="checkbox"/> Supervisors | <input type="checkbox"/> Other: _____ | |
| <input type="checkbox"/> Donors | <input type="checkbox"/> Other: _____ | |
- * local Communicable Disease Centre

Scope

- | | |
|--|-------|
| <input type="checkbox"/> Geographic area(s): | _____ |
| <input type="checkbox"/> Programme service(s): | _____ |

Target group(s)

- | | |
|--|--|
| <input type="checkbox"/> Children 1 month | <input type="checkbox"/> Women 15-49 yrs |
| <input type="checkbox"/> Children 12-23 months | <input type="checkbox"/> Married women 15-49 yrs |
| <input type="checkbox"/> Children 1-4 yrs | <input type="checkbox"/> Pregnant women |
| <input type="checkbox"/> Children 5 yrs | <input type="checkbox"/> Other: _____ |

Cases

- | |
|------------------------------------|
| <input type="checkbox"/> Mortality |
| <input type="checkbox"/> Morbidity |

Causes

- | |
|------------------------------------|
| <input type="checkbox"/> Mortality |
| <input type="checkbox"/> Morbidity |

Other

- | |
|---|
| <input type="checkbox"/> Specify: _____ |
| <input type="checkbox"/> Specify: _____ |



WORKSHEET 2: SPECIFY THE SURVEILLANCE PROCEDURES

Step 2: Define the data to collect			Step 3: Select the methods		
Target group	Mortality/ Morbidity/ Other	Indicator	Data collection		
			Frequency	Source	Method*

* Routine, Sentinel, Sample survey/special study, Case/outbreak investigation, Verbal autopsy

WORKSHEET 3: DEVELOPING ACTION PLANS

ACTION TO TAKE (What)	RESPONSIBLE (Who)	DATES (When)	OTHER (Where, How, Resources)



A.2: TEMPLATES FOR PRODUCING CHARTS

This section is made up of a number of pre-formatted charts of various kinds. These charts have been designed to illustrate various ways that you can display different sets of data. In most cases the same data are used for a number of charts so that you can see the differences immediately. Just select the pattern you prefer and draw your own charts.

The charts are also on the computer disk that comes with this module, both in *Lotus 1-2-3* and *Quattro Pro*. We call these "templates." You can substitute your own data, titles, legends, etc. into the computer file and then choose the type of display you wish. The name of each chart and computer file are shown in the title for easy reference. To use a template, simply load the appropriate computer file, substitute your own data, titles, and any other information you want to add, and then select the view mode. You can print these charts out, of course, make transparencies of them to use on overhead projectors and make copies for handouts.

This is a list of the charts included in this appendix:

Template A: One variable counts - one series of data (GRAPH_A.WQ1)

- A-1 BAR
- A-2 LINE
- A-3 ROTATED BAR
- A-4 AREA

Template B: One variable counts - two or more series of data (GRAPH_B.WQ1)

- B-1 STACKED BAR
- B-2 3D-BAR
- B-3 RIBBON
- B-4 BAR

Template C: Frequency distributions - one series of data (GRAPH_C.WQ1)

- C-1 PIE
- C-2 EXPLODED PIE
- C-3 BAR



Template D: Frequency distributions - two or more series of data (GRAPH D.WQ1)

D-1 COLUMN

D-2 3-D BAR

Template E: Correlations - two variables (GRAPH E.WQ1)

E-1 XY

E-2 BUBBLE

Template A: One variable counts - one series of data [File: GRAPH A.WQ1]

The two columns on the right are all you need to make a basic graph. The first column is the list of months (you can substitute names: JAN, FEB; or letters: J, F, M). The second column is the data for each month. In this example, these are reported cases of VD each month.

Months	Cases
1	6
2	8
3	11
4	4
5	12
6	8
7	
8	
9	
10	
11	
12	

Data for the first six months have been entered. Just add data for each month as they become available. You don't have to change anything else. Substitute your own data and press the F10 key to see the graph. Press <Esc> to return to this screen.

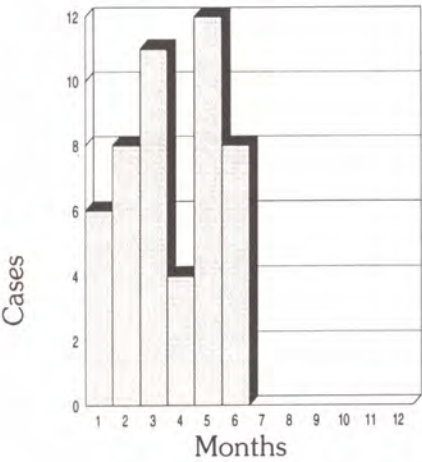
You can display the same data using different types of graphs. This template has been set up to display ONE VARIABLE using four alternative graphs: LINE, BAR, ROTATED BAR, and AREA. To switch from one graph to another, press /, Graph, Type, and select one of these four types of graph. Then press View to see it.

To change the titles, press /, Graph, Text and select the line you want to edit. See your computer manual for more information about making graphs.

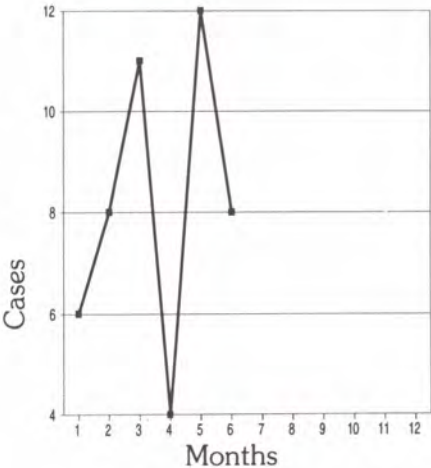


Reported cases of VD: 1991 Bimanu Health Centre

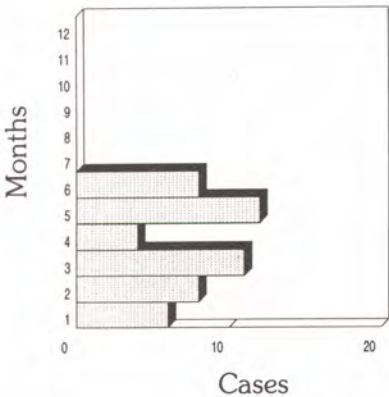
A-1: Bar



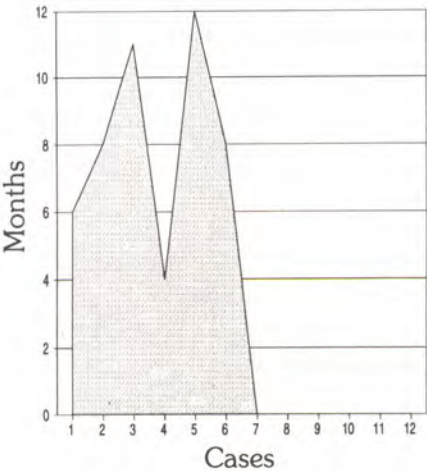
A-2: Line



A-3: Rotated bar



A-4: Area



Template B: One variable counts - two or more series of data [File: GRAPH_B.WQ1]

Very often you will want to display two or more series of data. The following examples show how to do that. The example also illustrates how the "X-axis" can be changed from a time dimension (months, weeks, years) to places (health centres, provinces, villages, etc.). You can also substitute people (CHWs, children by immunization status, etc.). Thus, these graphs can be used to display data on TIME, PLACES, and PEOPLE, merely by substituting the data and titles. Also note that you can enter your data in the spreadsheet in a horizontal or vertical direction. It doesn't matter.

These illustrative data are of reported cases of measles (one variable) from several health centres over a two-year period. Data for 1991 are the FIRST series, those for 1992 are the SECOND series. You can enter six or more series in most graph programmes, however, they can become cluttered and difficult to read if there are more than three or four series.

The two new types of graphs on the left are called STACKED BAR and RIBBON. The graph on the upper right is called a 3D-BAR. Also notice the addition of LEGENDS in these graphs. Often, when you have more than one series of data, you need to add legends to distinguish one series from the other. In these examples, the legends distinguish 1991 from 1992.

Health centres

	North	Tustin	Baro	Selin	Bagio
1991	45	67	87	65	56
1992	82	98	123	88	77

Series 2

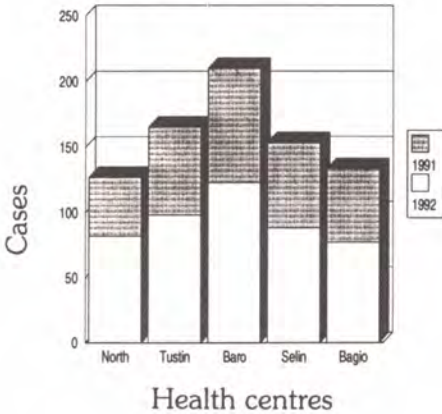
Series 1



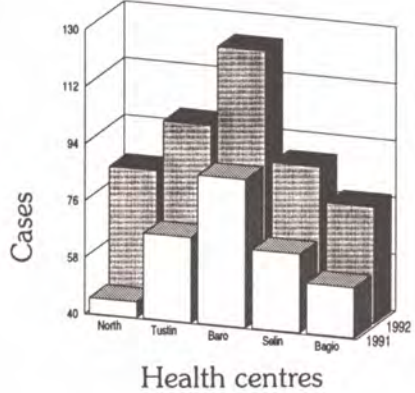
Reported cases of measles: 1991-1992

Routine surveillance: Under age five

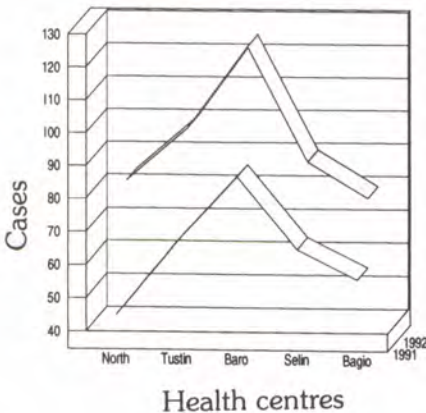
B-1: Stacked bar



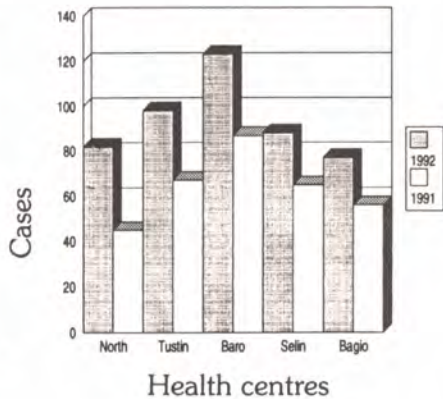
B-2: 3D Bar



B-3: Ribbon



B-4: Bar



Template C: Frequency distributions - one series of data [File: GRAPH_C.WQ1]

Templates A and B are used to display counts of variables. They show HOW MANY cases occurred, HOW MANY people died, etc. Frequency distributions show the PERCENTAGE of cases in various categories. For example, the percentage of children who died of malaria, ARI, injuries, and so forth. You can use bar graphs to show percentage distributions as well as counts. And you can also use PIE charts.

The following example shows how to use pie graphs to display frequency distributions. It also shows one way to display data about PEOPLE, in this case, the percentage of neonatal deaths by cause.

Data for C-1: Pie graph and C-2: Exploded pie graph;

Main causes of neonatal deaths

Main cause	Number
Prematurity/trauma	432
Tetanus	255
ARI/Pertussis	123
Diarrhoeal diseases	67
Others	221
Total	877

Pregnancy complications

Age	Number	Percent
15-19	14	10.3%
20-24	26	19.1%
25-29	28	20.6%
30-34	34	25.0%
35-39	22	16.2%
40-44	12	8.8%
Total	136	100.0%

These percentages would be entered as Series 1 of your graph. You can then select other types of graphs, as explained in Template A.

You don't need to compute the percentages yourself with these kinds of graphs, the computer program does it for you.

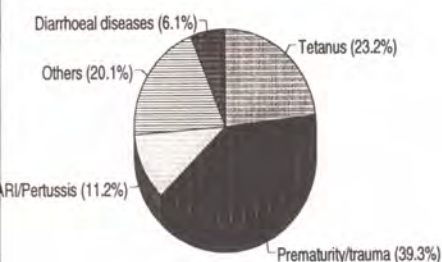
Pie graphs have a unique feature that you may want to use. They can be "exploded." One or more pieces of the pie can be partially moved for emphasis, as shown in C-2.

The graphs on the next page show several other ways to display frequency distributions. One way is to compute the frequency percentages yourself and then enter them into one of the graphs shown in Templates A or B (line, area, bar, stacked bar, rotated bar, ribbon). If you want the percentages to be displayed, you can do this by selecting the "Interior labels" option (press /, Graph, Customize series, Interior labels, select the series to be displayed, <Enter>, then select where you want to place the labels (top, right, etc.).

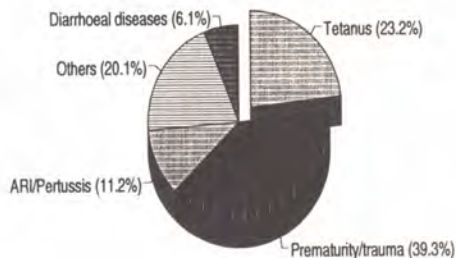


Main causes of neonatal deaths 1098 infants, 1986

C-1: Pie

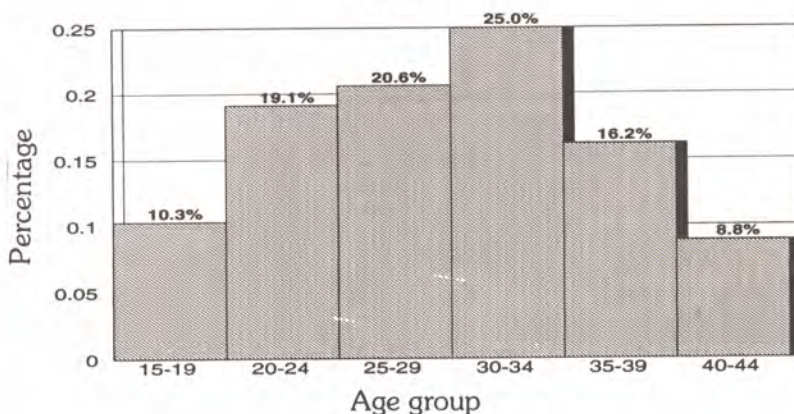


C-2: Exploded Pie



Pregnancy complications by age group: 136 women, 1992

C-3: Bar



Template D: Frequency distributions - two or more series of data [File: GRAPH_D.WQ1]

You can also use a COLUMN graph to display frequency distributions. Note that this graph displays the name of the disease as well as its percentage, just as the PIE graphs do. You can compare data from different sites, or different periods of time, or different types of people by entering each one as a separate series. You need to save each series as a separately NAMED graph. In this example the first graph is named HC#1, and the second is HC#2. To display (or print) one of the graphs, press /, Graph, Name, and select the graph you want, then press View to see it.

Data for D1-2 for column graphs

Sentinel centres		
	HC#1	HC#2
Malaria	154	231
STD	198	256
ARI	221	316
Diarrhoea	422	366
Other	677	743

Data for D3 column graph

Sentinel centres						
	HC #1 Number	Percentage	HC #2 Number	Percentage	HC #3 Number	Percentage
Malaria	154	9.2%	231	12.1%	186	10.6%
STD	198	11.8%	256	13.4%	245	13.9%
ARI	221	13.2%	316	16.5%	267	15.1%
Diarrhoea	422	25.2%	366	19.1%	321	18.2%
Other	677	40.5%	743	38.9%	744	42.2%
Total	1672	100.0%	1912	100.0%	1763	100.0%

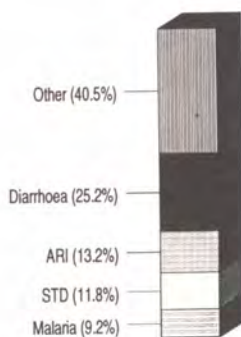
You can also compute the percentages yourself and enter these into a graph, just as in Template D. The following example shows data from three sentinel surveillance centres.



Disease report 1991: Sentinel centres

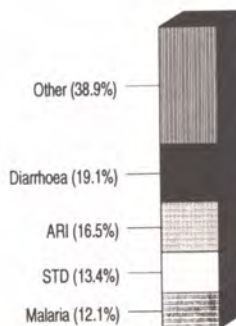
Sentinel centre 1

D-1: Column



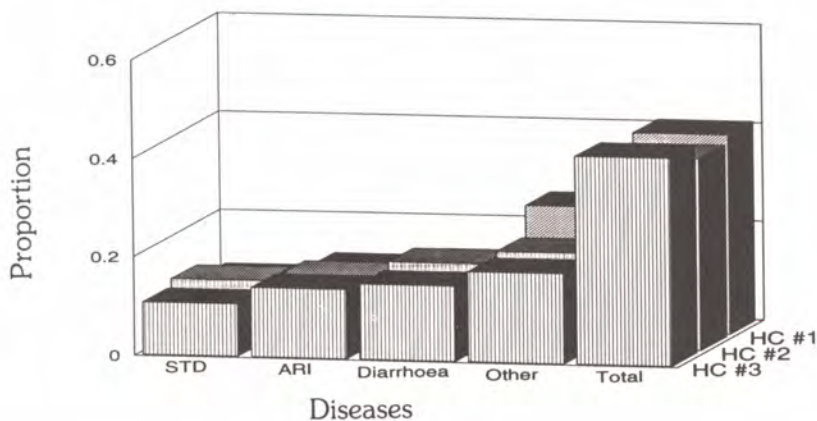
Sentinel centre 2

D-2: Column



Sentinel centres 1-3

D-3: Columns



Template E: Correlations - Two Variables

[File: GRAPH_E.WQ1]

You can show the relationship between two series of data, such as age and a disease. You do this by listing two blocks of data and then identifying the spot in the graph where the values of the two variables intersect. The type of graph that is produced is often called an XY graph, because you plot one value (say age) on the X axis and the other value (say the number of ill people) on the Y axis. You can either plot a large number of data points, which produces a SCATTER diagram, or group the data (say into five-year age groups) and connect the data points with lines. If you have enough data, you can also do statistical tests (usually regressions) to see if there is a statistical relationship between the two variables. In general, does one increase or decrease as the other changes?

One such graph is shown below. It is based on the first two variables and shows the number of children in three-month age groups who are malnourished. The slope of the line shows that malnutrition increased with age up to 18 months and then declined sharply.

Age (months)	6	9	12	15	18	21	24
ARI	18	23	36	33	42	28	21

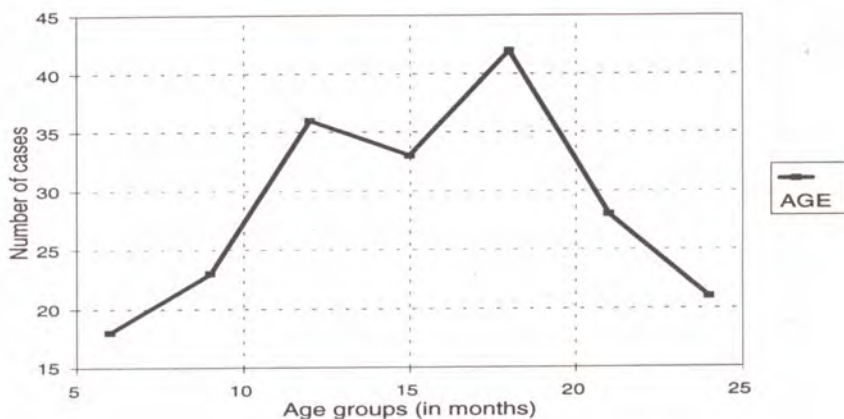
The next graph, a BUBBLE graph, lets you add a third variable. In this example, that is SEVERITY. Malnutrition is usually measured in degrees (1, 2, 3), with 3 being severely malnourished. By taking the average severity of malnourishment in each age group, we can show where the problem was greatest, since the size of the bubble indicates the severity.

The graph shows that the severity of malnutrition increased as the number of cases increased. Then it began to decline.

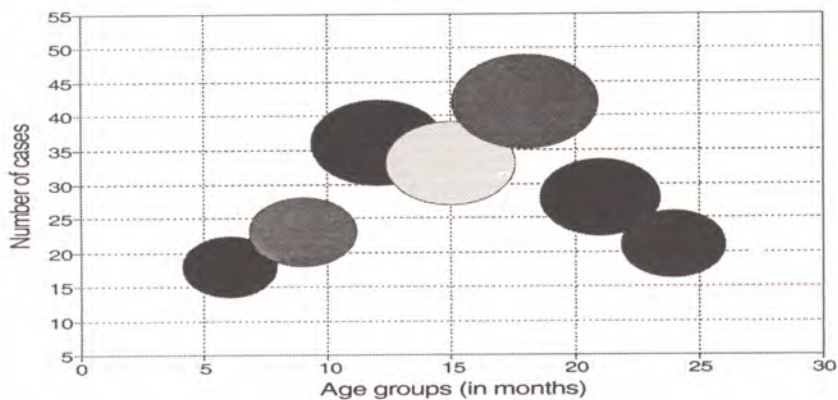
Consult your computer manual if you are interested in learning more about displaying your data. The computer programs are very versatile now, and very "user-friendly." With a little effort, you, or one of your staff, can learn how to make effective presentations fairly rapidly and easily.



ARI cases by age of child, June-July, 1990



Malnourished cases by age of child, June-July, 1990



Appendix B: Common diseases, definitions and indicators

This appendix is a listing of some common diseases that many PHC programmes deal with regularly. Some of these are specific to certain regions of the world and may or may not be problems in your area. Many more could be added, and you are encouraged to identify those that are important to you but which are not listed. You may find it helpful to develop a summary like those listed in this appendix. That way everyone will have a common understanding of definitions and indicators to use. The diseases included in this appendix are listed below.

Common priority diseases and health problems for surveillance in developing countries

Acute respiratory infections	HIV/AIDS	Tetanus
Acute watery diarrhoea	Measles	Trachoma
Cholera	Neonatal tetanus	Tuberculosis
Diphtheria	Pertussis	Urinary schistosomiasis
Dysentery	Poliomyelitis	

The terminology used in this appendix is defined below:

Standard case definition: Clinical definition of the disease.

Lay definition: Common, non-clinical definition, using clear terms to identify symptoms.

Incubation: The time interval between initial contact with an infectious agent and the first symptom of the disease.

Indicator(s): An indirect measure of a phenomenon that cannot be easily measured directly (for example, weight-for-age as an indirect measure of health/nutritional status).

Background indicator: Information that provides a context against which morbidity and mortality will be interpreted.

Estimation: The type of measure used to estimate the incidence or prevalence of a disease.

Rate: The frequency of occurrence of some event, such as kilometres/hour, cases/month.

Data sources: Typical sources of data for these indicators.

Used for: Typical management uses, such as for needs assessment, baseline and follow-up assessments, etc.



Mortality ascertainment via interview: Degree to which the indicator can be used to determine the cause of death.

Value and limitations: Utility of the indicator with respect to monitoring, evaluation, etc. Limitations, such as cost, validity, etc.

Comments: Relevant comments on the effect of the diseases characteristics on measurement; other factors that affect the indicator.

ACUTE RESPIRATORY INFECTIONS (ARI)

Standard case definition: Fast breathing (60 per minute or more if child less than two months; 50 per minute or more if the child is two months up to 12 months; 40 per minute or more if child 12 months up to five years) is a sign of **pneumonia**. The severity of the pneumonia is judged on the presence of chest indrawing (the lower chest wall draws in when the child breathes in). Look for non-specific signs of pneumonia, sepsis or meningitis: the child stops feeding well, is abnormally sleepy or difficult to wake, has fever or low body temperature (35.5 C) or has convulsions.

Lay definition: "Pneumonia" (defined as fast breathing) and "change" in normal behaviour.

Incubation: Varies according to the agent. Often unknown.

Indicator(s): Number of children diagnosed with pneumonia.

Background indicator: Currently not identified.

Estimation: Incidence by age groups; Case fatality rate.

Data sources: Hospital and health centres registers; health care facilities and household surveys.

Used for: Needs assessment and monitoring of ARI control activities.

Mortality ascertainment via interview: High.

Value and limitations: Not all cases are brought to curative facilities. However, after an initial training of the health staff and of community health workers in identifying the symptoms of pneumonia and of severe pneumonia, the quality of reporting should improve significantly.

Comments: Currently, ARI is probably the leading cause of death among young children in less developed countries. Surveillance of pneumonia is an essential step in its recognition as a priority and in monitoring progress in its control.

ACUTE WATERY DIARRHOEA

Standard case definition: Frequent loose and watery stools often associated with fever and vomiting.

Lay definition: Watery diarrhoea as defined by the mother.

Incubation: Variable depending upon the agent responsible. Generally between eight to 18 hours.



Indicator(s): Number of reported cases by age groups.

Background indicator: Percentage of households: a) using a latrine; b) having access to safe water.

Estimation: Incidence of acute watery diarrhoea; number of episodes per child per year.

Data sources: Hospital and health centre registers. Health centres and household surveys.

Used for: Needs assessment. Monitoring of diarrhoeal diseases control activities (as a denominator of the estimation of case management). Outbreak investigation.

Mortality ascertainment via interview: High.

Value and limitations: Most clinical cases of diarrhoea go unreported, except in settings having extensive monitoring of decentralized ORS packets delivery. Incidence has seasonal variations which has implications for the timing of surveys.

Comments: Although case identification is necessary, WHO stresses the importance of adequate case management.

CHOLERA

Standard case definition: Sudden and severe watery diarrhoea with rapid dehydration.

Lay definition: Many local terms often meaning “deadly diarrhoea.”

Incubation: From a few hours to five days; usually two-three days.

Indicator(s): 1. Number of suspected cases and deaths; 2. Number of laboratory-confirmed cases.

Background indicator: Occurrence of outbreaks in the past.

Estimation: Attack rate by age group and gender.

Data sources: Outbreak investigation in non-endemic area; hospital and health centres registers in endemic areas.

Used for: Outbreak investigation. Needs assessment.

Mortality ascertainment via interview: High.

Value and limitations: Assessment of the quality of food-handling and water and sanitation in non-endemic areas; assessment of health education (ORT) and case management in endemic areas.

Comments: Reporting of cholera cases is often considered as sensitive information by MOH, because of the implication for exportation of edibles and on tourism.



DIPHTHERIA

Standard case definition: Acute pharyngitis, acute nasopharyngitis, or acute laryngitis, with a pseudo membrane.

Lay definition: Sore throat, with grey patch or patches in the throat.

Incubation: Usually 2-5 days, occasionally longer.

Indicator(s): Number of cases.

Background indicator: Vaccination coverage DPT3 by 12 months of age.

Estimation: Incidence not predictable.

Data sources: Health centre registers and, occasionally, from outbreak investigation.

Used for: Not used.

Mortality ascertainment via interview: Low.

Value and limitations: Low.

Comments: Often occur as outbreaks when social or natural conditions lead to crowding of susceptible children.

DYSENTERY

Standard case definition: Diarrhoea with blood, mucus and pus accompanied with fever, nausea and sometimes vomiting.

Lay definition: Diarrhoea with blood and mucus.

Incubation: 1-3 days on average.

Indicator(s): Number of cases by month and by age groups.

Background indicator: Water and sanitation status.

Estimation: Incidence.

Data sources: Hospital and health centre registers. Health centres and household surveys.

Used for: Needs assessment. Monitoring of diarrhoeal disease control activities (as a denominator of the estimation of case management). Outbreak investigation.

Mortality ascertainment via interview: High. Some types of *Shigella* (the agent) have a case fatality rate among hospitalized patients as high as 20%.

Value and limitations: Generally under reported. Seasonal variations.

Comments: In addition to continued feeding and prevention of dehydration, dysentery cases must receive appropriate antibiotic treatment.



HIV/AIDS

Standard case definition: For epidemiological surveillance an adult (above 12 years) is considered to have AIDS if:

A test for HIV antibody gives positive results AND one or more of the following are present:

- >10% body weight loss or cachexia, with diarrhoea or fever, or both, intermittent or constant, for at least one month, not known to be due to a condition unrelated to HIV infection.
- Tuberculosis with the combination of weight loss plus fever or plus diarrhoea as described above.
- Tuberculosis that is disseminated (involving at least two different organs) or miliary; or extra-pulmonary tuberculosis (which may be presumptively diagnosed).
- Kaposi's sarcoma.
- Neurological impairment sufficient to prevent independent daily activities, not known to be due to a condition unrelated to HIV infection (for example, trauma).
- Candidiasis of the oesophagus.

Lay definition: Local terminology. In many countries of Africa, the term "slim" is used.

Incubation: One to three months between exposure and sero-positivity; up to ten years between HIV-1 infection and the development of AIDS.

Indicator(s): Number of cases by age group.

Background indicator: Prevalence of sero-positivity.

Estimation: Incidence and Prevalence.

Data sources: Hospital and health centre registers; TB control unit surveillance reports; laboratory registers.

Used for: Need assessment. Monitoring of control activities.

Mortality ascertainment via interview: High.

Value and limitation: The case definition: is simple to use; includes extrapulmonary and pulmonary tuberculosis; and has high specificity. However it has a low sensitivity.

Comments: Screening of blood donors in hospitals is often an initial step in surveillance to document the existence of sero-positive individuals in the community and discuss further steps.



MEASLES

Standard case definition: History of a generalized maculo-papular rash lasting three or more days and history of any one of the following: cough, coryza, conjunctivitis.

Lay definition: History of fever and rash and any one of the following: cough, running nose, red eyes.

Incubation: About ten days, varying from seven to 17 days from exposure to onset of fever, usually 14 days until rash appears.

Indicator(s):

1. Number of cases of measles
 - a) total
 - b) by age:
 - less than nine months
 - between 9-23 months
 - more than two years
2. Percentage of cases of measles with a documented valid vaccination against measles, by age group.

Background indicator: Percentage of infants having a valid measles vaccination by 12 months of age.

Estimation: Depending upon the time of the year, the vaccination coverage and the population density. Each country and district differs. As an example, between 1891-1991, the rate for the countries of the WHO South East Region ranged between 29.2 and 10.54 per 100,000 population.

The expected number of **cases** among children in your area can be estimated, using the formula: $a \times b \times .85 \times .90$

a= number of surviving children

b= coverage in the age group

c= vaccine efficacy: 85%

d= incidence rate: 90%

Data sources: Routine and sentinel reporting; outbreak investigation.

Used for: Assessing effectiveness EPI and quality of MCH. Must be included in needs assessment, baseline and periodic evaluation.

Mortality ascertainment via interview: High.

Value and limitations: Useful to assess the quality of protection to high-risk groups, particularly among refugees.

Comments: Measles is a seasonal disease each year with an epidemic occurring every two to three years depending upon local conditions. Increased vaccination coverage rates lowers the magnitude of yearly seasonal peaks and widen the epidemic intervals.



NEONATAL TETANUS

Standard case definition: History of normal suck and cry for the first two days of life, AND history of onset of illness between three and 28 days of age AND history of inability to suck followed by stiffness and/or "convulsions" and death (80% of cases).

Lay definition: History of normal suck and cry first two days of life, AND history of inability to suck, convulsions and/or stiffness between three and 28 days of age. In several cultures, history of the baby turning "blue."

Incubation: Between three to 21 days with a range between one day and several months. In the majority of cases incubation is about ten days.

Indicator(s):

- 1) total number of cases of NNT:
- 2) number of NNT cases according to the immunization status of their mothers
- 3) percentage of NNT cases delivered by a trained attendant.

Background indicator: a) percentage of infants found protected against NNT at the time of receiving DPT 1; b) TT vaccination coverage of women of child bearing age.

Estimation: To calculate the expected number of cases: $a \times b \times .8 \times .01$

a = number of newborns

b = coverage (at the time of DPT 1)

c = vaccine efficacy: 80%

d = attack rate: 10 per 1000 live births (1%)

Data sources: Vital registration and/or lay TBA reporting; Vaccination records; MCH records.

Used for: Needs assessment and PHC overall monitoring.

Mortality ascertainment via interview: High by the use of verbal autopsy technique.

Value and limitations: NNT rate is a good predictive indicator of IMR and of MMR.

Comments: Neonatal tetanus cases have a tendency to cluster. Each case should be investigated.

PERTUSSIS

Standard case definition: History of severe cough and history of any one of the following: cough persistent two or more weeks, fits of coughing, cough followed by vomiting.

Lay definition: History or observation of repeated and violent coughing and history or observation of any one of the following: cough persisting two



or more weeks, fits of coughing, cough followed by vomiting, typical “whoop” in older infants and children.

Incubation: Commonly seven to 10 days, rarely exceeding 14 days.

Indicator(s): Number of cases by age-groups.

Background indicator: Vaccination coverage DPT 3 by 12 months of age.

Estimation: The expected number of cases can be estimated by the formula: $a \times b \times .8 \times .8$

a = number of surviving children

b = coverage in the age group

c = vaccine efficacy: 80%

d = incidence rate: 80%

Data sources: Hospital and clinic records.

Used for: Pertussis is generally not considered a high priority for surveillance.

Mortality ascertainment via interview: Medium; case fatality rate is usually 1%.

Value and limitations: Unless the staff has been trained in the differential diagnosis of pertussis (ARI), case ascertainment can be difficult. However pertussis surveillance might be of interest in the monitoring of active ARI control programmes and because of its importance (like measles) in worsening malnutrition.

Comments: Should be included in the list of reportable diseases in refugee situations.

POLIOMYELITIS

Standard case definition: Any patient with acute flaccid paralysis (including any child less than 15 years of age diagnosed to have Guillain Barré Syndrome) for which no other cause can be identified.

Lay definition: History of sudden onset of weakness and paralysis of the leg(s), and/or arm(s) and/or trunk, AND documentation that paralysis was not present at birth or associated with serious injury or mental retardation.

Incubation: Commonly between seven to 14 days for paralytic cases.

Indicator(s):

1. Number of cases of acute flaccid paralysis with date of onset and age at onset, vaccination status.
2. Number of suspected cases of polio.
3. Number of confirmed cases of polio.

Background indicator: Vaccination coverage OPV 3 by 12 months of age.



Estimation: From zero polio in the Americas and 1814 cases reported in 1991 in the WHO Africa region to 6020 reported for India alone in 1991. Locally, the expected number of cases among children can be estimated: $a \times b \times c \times d$ with:

a = number of surviving children

b = coverage (use local figure if available)

c = vaccine efficacy: 90% for OPV 3

d = attack rate: 0.6% (use local rate if available and recent).

Data sources: Weekly or monthly surveillance reports; laboratory reports.

Used for: Assessing the effectiveness of polio eradication activities and the quality of surveillance.

Mortality ascertainment via interview: Low. The number of deaths can be guessed by assuming a case fatality rate of five percent.

Value and limitations: Each new case should be considered on its own merits as a challenge to the health team.

Comments: A must in the current context of polio eradication efforts.

TETANUS (besides neonatal tetanus)

Standard case definition: A case of tetanus occurs when a person has: (1) a stiff jaw and trouble opening the mouth or swallowing; (2) painful stiffness of the neck and abdominal muscles (often other body muscles get stiff too); (3) a clear mind; (4) a wound, often infected, or history of a wound within the past few weeks. In severe cases, the person may appear to be smiling (risus sardonicus) with raised eyebrows. His back and neck may be arched, his arms bent with fists clenched at his chest, and his legs extended. Noise, light or touching the person may trigger sudden, painfully tightening of the muscles (convulsions).

Lay definition: History of injury or ear infection followed by difficulty in opening mouth (or jerking of the mouth) or stiffness of the neck or body.

Incubation: Between three to 21 days with a range between one day and several months. In the majority of cases incubation is about ten days.

Indicator(s): Number of cases by age group.

Background indicator: None for male adults as vaccination status is generally unknown. For females of child-bearing age: TT 2 or TT 3 vaccination coverage.

Estimation: Currently difficult as surveillance is neglected.

Data sources: Hospital or health centre registers; in some places, lay reporting of vital events.



Used for: Initial needs assessment. Measuring rate of complications of associated diseases (like Guinea worm, for example) or other hazards (contaminated street drugs in urban settings, for example).

Mortality ascertainment via interview: High by verbal autopsy techniques. Among males, search for a history of an open wound; among females, tetanus is often a complication of septic abortion or delivery.

Value and limitations: Useful for the monitoring of MMR and of adult health for occupational hazards (agriculture).

Comments: Generally underestimated.

TRACHOMA

Standard case definition: Chronic inflammation of the eyes, leading to shrinkage and turning-in of lids and blindness.

Lay definition: Blinding disease.

Incubation: Five to 12 days.

Indicator(s): Diagnosis of lymphoid follicles and hypervascularisation of the cornea, particularly on the tarsal conjunctiva lining the upper eyelid;

Background indicator: Prevalence of corneal scars and blindness among adults.

Estimation: Prevalence among children.

Data sources: Periodic surveys; in areas where the health staff has been trained, from health registers.

Used for: Needs assessment and monitoring of intervention.

Mortality ascertainment via interview: N.A.

Value and limitations: Good for a given ecological area.

Comments: Trachoma is a disease of poverty, unhygienic surrounding (flies and scarce water resources) and dust (Sahel particularly). Trachoma is rarely a primary cause of consultation.

TUBERCULOSIS

Standard case definition: An ill child with a history of contact with a suspect or confirmed case of pulmonary tuberculosis. Any child who does not return to normal health after measles or whooping cough; with loss of weight, cough and wheeze who does not respond to antibiotic therapy for acute respiratory disease; with abdominal swelling with a hard painless mass and free fluid; with painful form or soft swelling in a group of superficial lymph nodes; with any bone or joint lesion of slow onset; with signs suggesting meningitis or disease in the central nervous system.

In adult, confirmed isolation of mycobacterium bacilli (acid-fast bacilli or AFB) in sputum; and/ or typical pulmonary lesions in X-rays.



Lay definition: An ill child with a history of contact with a suspected or confirmed case of pulmonary tuberculosis. Any ill child with one of the following:

- Who does not return to normal health after measles or whooping cough.
- With loss of weight, cough and wheeze who does not respond to antibiotic therapy for acute respiratory disease.

An adult with history of persistent cough not responding to antibiotic therapy and a loss of weight during the previous months and low-grade fever and/or sweating at night.

Incubation: From infection to demonstrable primary lesion or tuberculin reaction, about four to 12 weeks. While the risk of pulmonary or extrapulmonary reaction is greater in the following two years, the infection can remain latent throughout life.

Indicator(s):

1. Number of suspected cases (on clinical basis) by age group.
2. Number of cases bacteriologically and/or X-ray confirmed by age group.

Background indicator: Vaccination coverage for BCG.

Estimation: Incidence rates not predictable.

Data sources: Registers from health centres and/or from TB clinics; microbiology laboratory registers.

Used for: Needs assessment. Measuring the quality of reporting systems.

Mortality ascertainment via interview: Difficult, unless the deceased was a known patient who did not take his/her treatment regularly.

Value and limitations: Recently, the incidence of tuberculosis has been increasing worldwide for two reasons: a) the HIV/AIDS pandemic which increases the rate of secondary infections; b) increased resistance to known drugs. The monitoring of the incidence of tuberculosis might be of increasing value as a marker of AIDS transmission.

Comments: A disease often neglected by surveillance systems in the past, tuberculosis (particularly pulmonary tuberculosis) is to be included in the future because of new interest in respiratory infections and because of its growing toll on health.



URINARY SCHISTOSOMIASIS

Standard case definition: Clinical symptoms (frequent and uncomfortable urination with blood appearing in urine at the end) associated with presence of eggs of **Schistosoma Haematobium** in the urine.

Lay definition: Blood in urine.

Incubation: Two to six weeks.

Indicator(s): Number of cases of children six to 15 years having haematuria (blood in urine).

Background indicator: Percentage of children six to 15 years bathing under safe conditions; percentage of households having access to safe water.

Estimation: Incidence and prevalence.

Data sources: Health centre registers; periodic school surveys.

Used for: Needs assessment. Monitoring of control activities.

Mortality ascertainment via interview: Low. Urinary schistosomiasis is a chronic disease of the adult with a differential mortality.

Value and limitations: The presence of haematuria (assessed by dipsticks) has been found an acceptable test to confirm the diagnosis of **S. haematobium**. Re-infection occurs after treatment.

Comments: Surveillance is generally focused on school-attending children.



Appendix C: Case investigation forms

THE EXAMPLE OF NEONATAL TETANUS¹

Neonatal tetanus has been targeted for control by most national health programmes. Neonatal tetanus incidence is a reliable indicator of the quality and effectiveness of two important PHC activities: EPI and MCH. Each reported case of neonatal tetanus becomes a challenge to the PHC manager since it points to a failure of the programme; insufficient TT coverage, cold chain breakdown, poor TBA training or unhygienic delivery practices or handling of the umbilical cord. PHC managers should keep in mind the fact that NNT cases are often clustered.

Health centre supervisors should use a case investigation form to investigate all cases of neonatal tetanus. The purpose of investigating neonatal tetanus cases is to identify **why** the case occurred so that future cases can be prevented.

When investigating a case of neonatal tetanus, ask the mother of the infant if she is willing to answer some questions about her infant's illness. Explain that the information she provides will help you prevent future case. With the case investigation form in front of you, ask her the questions listed on the form, and carefully record her responses. The questions are about:

- The immunization status of the mother.
- Whether the mother received antenatal care.
- Where the baby was born.
- Whether a trained attendant was present at the time of the actual delivery.
- How the cord was cut and treated (was any substance smeared on it).
- Whether the infant sucked normally at birth, then later developed problems with sucking, convulsions and stiffness.
- Whether the infant was treated in a hospital for the illness and where.

If the mother is unable to answer, ask a close female relative who attended the birth or saw the infant during his first weeks of life.

On the following pages you will find a sample of a neonatal tetanus case investigation form.

¹ WHO/EPI/MLM/9.14 Training for mid-level managers; disease surveillance, revised 1991



PHC supervisors should monitor to make sure neonatal tetanus cases are investigated promptly and correctly and help with the investigations if needed. For example, a trained officer may conduct some case investigations himself or provide additional training if health workers are uncertain of the procedures to follow.

Follow these steps when analysing neonatal tetanus case investigation forms:

1. Confirm the diagnosis of each case. Review the form to make sure that each reported case of neonatal tetanus fulfilled the appropriate case definition of the disease.
2. Determine the immunization status of the mother of each neonatal tetanus case. Was the mother immunized? If not, why not? Was there a missed opportunity?
3. Look at the geographic distribution of cases by reviewing the disease map. This will tell you whether cases of neonatal tetanus are located in certain geographic areas or if they are widespread.
4. Look for similarities among cases. You may see a pattern that will help you identify solutions.

For example, did all mothers of neonatal tetanus cases go for immunization to the same health worker who does not immunize women at every opportunity? Did they use a common birth attendant or did they deliver their child at the same hospital?



NEONATAL TETANUS CASE INVESTIGATION FORM

Instructions: Either circle the appropriate response, or record the answer in the blank space following each item.

Province: _____ Village: _____ Health centre: _____

Date case reported: _____ Reported by: _____

Date of investigation: _____

Household address of case: _____

Name and job title of investigator: _____

A. CASE INFORMATION

Family name: _____ Given name: _____

Date of birth: _____ Sex: Male/Female

How long has the mother been resident in the area? _____

Ethnic group (if applicable): _____

B. IMMUNIZATION STATUS OF MOTHER AND ANTENATAL CARE

Was the mother immunized against tetanus? Yes/No

If yes, number of doses: _____ date of last dose _____

Did you see an immunization record? Yes/No

Did the mother receive antenatal care? Yes/No

If yes, location and dates: _____

Did the mother visit a health facility for reasons other than antenatal care during this pregnancy? Yes/No

If yes, give the reason for visit and dates: _____

C. BIRTH OF INFANT

Where was the baby born? Hospital/home/other: _____

If the delivery was in an institution, give the name and address of the institution: _____

Was the delivery attended by: doctor/traditional birth attendant/nurse/midwife/other: _____

If attended by a traditional birth attendant, give the name and address: _____

Describe how the cord was cut and with what type of equipment: _____

Describe how the cord stump was treated or dressed: _____



Neonatal tetanus case investigation (continued)

D. SYMPTOMS

Date of onset of illness: _____

Did the child suck and cry normally for the first two days of life? Yes/No

If no, describe: _____

Did the child later have a problem with sucking? Yes/No

If yes, describe: _____

Was the child stiff later? Yes/No

Did the child later have convulsions? Yes/No/Unknown

Other complications: _____

E. TREATMENT/OUTCOME

Was the patient cared for in health facility? Yes/No

If yes, where? _____

Was the patient seen by a health worker? Yes/No

If yes, give diagnosis: _____

Did the patient die? Yes/No

If yes, give date and details: _____

Comments: _____

F. TO BE ANSWERED BY HEALTH FACILITY STAFF:

Is this a case of neonatal tetanus? Yes/No

If yes, could this case have been prevented? Yes/No

If yes, describe: _____

What actions should be taken to prevent similar cases in the future? _____



Appendix D: Determining the cause of death

Assessing the probable leading causes of death allows managers to document the effectiveness of health interventions, and to identify changes that they can make in procedures to reduce unnecessary mortality.

However, causation is not always easy to determine. This appendix describes some of the common causes of death among young children and among women during pregnancy and childbirth. It discusses the ease or difficulty of measuring causation accurately.

Identifiable causes of death

The list of common causes of death in children is small, generally limited to diarrhoea, injury, neonatal tetanus, measles, ARI, malnutrition, and possibly such other neonatal conditions as sepsis. The following table lists these conditions. Those nearest the top are easier to verify through an interview with the mother than those near the bottom.

Table D-1: Childhood causes of death that can be determined through interview

	Childhood mortality
Relatively easy	Injury Neonatal tetanus Measles Diarrhoea Acute respiratory infection Malnutrition
Relatively difficult	Neonatal sepsis

Note that death due to injury or trauma tops the list. Drowning or falling off a cliff is seldom confused with other common causes of child death. Likewise the neonatal tetanus picture is quite distinct: an initially healthy baby develops stiffness/convulsions and an inability to suck dying on or after day three. Similarly the cough, fever, red eyes, and rash of measles is recognizable by family members. Diarrhoea and ARI are often more difficult to identify in different settings. Malnutrition is likely to be recognized if acute with marasmus, kwashiorkor, or marasmic kwashiorkor while chronic malnutrition, i.e., stunting, or milder forms will be missed.



Many other conditions are important of which **neonatal** ones are among the most challenging. Indeed, all but the most obvious causes of neonatal death are notoriously difficult to establish. "Unknown" rates for newborns are almost always higher than for older children.

In neonates:

Birth defects, if obvious, will be recallable if there is no social taboo. Major internal abnormalities, such as heart defects, of course will go undetected. Tiny babies will be reported, but in areas where small babies are common or even desired, they will go unnoted. Of great programmatic interest are newborns dying of birth trauma or birth asphyxia. While theoretically distinct, there are many hurdles to identifying these babies, especially the reluctance of mothers and birth attendants to report poor delivery practices. Newborns who die generally have many indistinguishable signs regardless of underlying cause: grey colour, irritability/sleepiness, poor feeding, abnormal breathing, vomiting and so on.

In addition to expanding the scope of ascertainment to the newborn, researchers are attempting to break down syndromes into meaningful distinct subsets. For example, diarrhoea syndromes probably can be divided into acute watery diarrhoea, persistent diarrhoea, and dysentery. This is important because the programmatic response varies for each. Likewise, pertussis (an EPI preventable disease) may be characteristic enough to be distinguishable from other fatal ARI conditions.

In older children:

Validly identifying common childhood killers, notably malaria and AIDS, poses additional challenges. Table D-2 lists some of these conditions by age and the likelihood that they could be diagnosed by interview.

Two points from Table D-2 need amplification. "Local ecology" (see malaria and AIDS) refers to the prevalence of the condition in the manager's setting. For example, if malaria is common, the general public, including the informant, is more likely to be able to recognize it. And malaria is statistically more likely to be the correct diagnosis than in areas where it is unusual. Related is the notion that specific programmes may have unusual killers that are not on this list. For example, visceral leishmaniasis is said to account for the largest PMR of child death in one north Pakistan valley. It is likely that it could be identified by interview although one will not find much expert guidance.



Table D-2: Other causes of childhood death ascertainable by interview by age with likely validity*

Condition	0 - 1 Month	1 Month -5 Yrs	Comments
Failure to feed	+++		e.g., after maternal death.
Prematurity	+	+	LBW is a childhood risk for 1-2 years.
Small for gestational age (SGA)	+	+	Although most LBW babies in developing countries are probably SGA, the distinction is important as programme response differs.
Hypothermia	+		More likely with LBW baby or in extreme environmental cold.
Milk aspiration	+		Not common.
Sepsis	+	+	Non-specific presentation, especially in neonates.
Hyaline membrane disease	+		Non-specific even in prematures.
Tetanus	+++	+	Readily diagnosable in newborns; uncommon thereafter.
Meconium aspiration	+		Difficult to distinguish from asphyxia, but programme response is similar for both.
Dysentery	+++	+	Important to distinguish as emphasis of programme response is different in each case: antibiotics vs. oral rehydration therapy vs. nutritional therapy.
Acute watery diarrhoea (AWD)	+++	+	Different in each case: antibiotics vs. oral rehydration therapy vs. institutional therapy.
Persistent diarrhoea	+++	+	
Pertussis		+	EPI significance; the "whoop" may be highly specific, but prolonged coughing is not (asthma, TB, foreign body, parapertussis, etc.).
Cerebral/CNS infection	+	+	Very non-specific in newborns; children may have meningitis, TB, cerebral malaria, encephalitis.
Malaria		+	Local ecology imperative.
AIDS		+ / ++	Local ecology imperative.
* + = low validity; ++ = medium validity +++ = high validity			



In women of child-bearing age:

Women in the reproductive years make up the other main target group of PHC. Many, perhaps 25-50% of all deaths in this age, are considered "maternal mortality," i.e., related to pregnancy, labour, delivery, or the first six weeks after termination of pregnancy. Most maternal mortality falls into five syndromes which can be recognized through a survey interview instrument (Table D-3). Of course, due to the social implications, abortion-related deaths are severely under-recognized.

Table D-3: Maternal causes of death that can be determined through interview

	Maternal mortality
Relatively easy	Post-partum haemorrhage Obstructed labour Eclampsia
Relatively difficult	Post-partum infection Abortion-related

Reporting Deaths

Step 4 in the main text described several ways that deaths can be identified, recorded and reported. The two major ones are: 1) a death report (see Exhibit 4), which extracts information on deaths from hospital, clinic, and provider records, and 2) an outreach register (see Exhibit 3).

The usefulness of medical records is limited even when they exist and when they can be located. Busy medical staff appropriately spend more time attending to desperately ill patients than they do writing in charts. Outreach workers do not usually have first-hand knowledge of the death and can only get a rough idea of the cause of death. As a result, you probably will not find the detail that you would need to identify cause of death in these reports and records. In addition, you also have to be careful to ensure that the record consulted is, indeed, that of the deceased and that the deceased is from your catchment area.

Verbal autopsies

As noted before, in the absence of a formal autopsy, the best way to establish cause of death is through a **verbal autopsy** (VA). This concept has been broadly introduced in previous sections and a step-by-step approach is proposed in Appendix E. The technique consists of "verbally," i.e., with an interview, conducting an "autopsy," i.e., ascertaining the causes of death. There is usually no better way because the death may have been undocumented and in the (possibly remote) past.



How to process the data

Assign a cause of death

Once deaths have been reported and a VA conducted, a cause must be assigned and coded before the information can be tabulated.

Assigning a diagnosis can be done in two different ways. Some use clinical judgement of one or more experts, usually paediatricians and obstetricians. Ideally, at least two should reach agreement by consensus. The other approach does not rely on the presence of an expert panel. It uses objective scoring systems for each condition, various signs are sought and are pre-classified as either major or minor, different combinations of which make the diagnosis. For example, a probable ARI death requires the presence of cough for more than two days, rapid breathing for more than one day plus one of the following four: chest wall indrawing, nostril flaring, grunting on breathing out or blue lips/tongue.

An added complexity is the probabilistic weighting added to assigning the diagnosis. This can be omitted; however, it adds little work and is quickly grasped. The rationale is that some combinations of clinical information are likely to have a **greater positive predictive value** than others for the condition in question. In the ARI example, cough and rapid breathing lead to a *possible* diagnosis whereas cough and rapid breathing AND any one of the additional four signs of respiratory difficulty lead to a *probable* diagnosis. Note that in the field a *certain* diagnosis is never possible.

Assigning cause of death, even using these scoring systems, requires additional skills. This should be the responsibility of the interviewer's supervisor. Occasionally the *verbatim* history will clarify "DK" (don't know) responses enough to allow assigning a possible or even probable cause of death. You may decide to re-interview households if your unknown ratio is unacceptable, say, above ten to 20%.

Coding the cause of death

Coding the diagnosis is the next step, having made the diagnosis or diagnoses for the case. International convention uses terminology such as "immediate, underlying, and antecedent cause," and "other significant conditions." These reflect a biomedical, Western bias where patients are more likely to die in a hospital fully documented. These terms have little relevance to the developing world where people die from multiple causes often without a clear primary condition and with no documentation.

Thus, a different coding system using two types of diagnosis is proposed: *main* and *associated*. The main diagnosis is the one, in the opinion of the coder, which is likely to be the most important. All others are associated



causes. Because sequence plays a role, a condition closer to the time of death is the main cause. So for a baby with diarrhoea for two weeks who develops cough and rapid breathing three days before death: Main = ARI, Associated = diarrhoea.

It is often difficult or impossible to distinguish which is the main cause, as in the case of nearly simultaneous ARI and diarrhoea. Decision rules are required for a host of circumstances. In this example, we code ARI as the main and diarrhoea as the associated cause.

Malnutrition can be confusing, too and should be listed as an associated cause unless there is evidence that the child died purely from insufficient food, a very rare event. Obviously, the vast majority of children dying with malnutrition die of infection, and this would be listed as the main cause.

Unforeseen circumstances require specific rules as they arise. These should be recorded in a VA procedure manual and consistently followed in the future.

Each PHC program can decide for itself its coding rules. It does not really matter what is decided. Bias will be present, but this can be dealt with in the interpretation. More important is that random error is minimized. Most important is that the **coding of diagnosis will not lose information so long as all information is analyzed.**

Coding requires some technical skills, including using the procedure manual and making logical decision rules for special cases. We recommend that the assigner make only tentative recommendations. The coder, then, checks the assigner's scoring, reviews the case, and codes the diagnoses.

How to analyze mortality data

Dual analysis

Following the coding methods described previously, analysis is a dual process: 1) cause of death by main cause and 2) cause of death by **consolidated** cause, that is, all causes combined. For comparison purposes over time and among programs, analysis by single (main) cause is standard. However, analysis by consolidated cause yields the PHC manager more information. In the consolidated analysis the numerator is the count of **diagnoses**, not individuals. These die **with** a condition rather than **of** it. Once this is grasped, one can see that consolidated analysis is a powerful way to measure the true burden of given conditions.

Table D-4 shows hypothetical data by way of illustration. Consider diarrhoea. Of 61 deceased children, 40 died of diarrhoea as the main cause. Of these, 20 had no associated cause; 12 had ARI; eight had malnutrition; three had measles; ten were LBW. Look at the ARI row. Of the 21, 11 had



ARI without any associated cause. However, eight had diarrhoea as an associated cause, and so on. The number of children dying with diarrhoea, then, is 48 (40 + 8). Similarly, the number of children dying with ARI is 21 + 12 = 33, not 21.

Table D-4: Causes of death: main and associated (hypothetical)

Main cause		Associated causes					
No. cases	Total	no cases	ARI	diarr.	malnutr.	measles	LBW
Diarrhoea	40	20	12	-	8	4	10
ARI	21	11	-	8	3	3	5
Total	61	31	12	8	11	7	15

Note also that the row totals do not equal the total number listed in the main cause column. In other words, in the diarrhoea row, $20 + 12 + 8 + 3 + 10 = 53$, not 40. How can this be? It is because children dying with diarrhoea not only had one, but often two or more associated conditions. That is, the 20 (40 - 20) who did have associated conditions actually accounted for (53 - 20) 33 associated conditions. Play with the numbers for a few minutes and you will grasp this easily.

Note that the only total figure which corresponds to the number of deceased **children** is 61. The totals of the numbers of children dying **with** various conditions is greater than the number of deaths because children die with more than one condition. This also means that there are strategies for controlling different diseases that will impact a single disease's mortality burden. Conversely, reducing the cause-specific mortality of a specific disease will also reduce mortality due to other killers. Indeed, ARI programs are remarkably effective in lowering both pneumonia mortality and measles mortality.

Examples of analysis and response

The following examples of types of analysis and data presentation may guide PHC managers. The figures come from AKU's experience in five Karachi PHC programs with a population base of about 45,000 in 1991 when the IMR was 63. The results were obtained using an earlier instrument which has since been improved. These types of analysis and computations are readily performed by hand with or without a pocket calculator.

Table D-5 shows the breakdown by **main** cause of death among all children under five years of age. EPI is well in place, but controlling diarrhoea is still a major challenge. ARI is a moderate problem although we believe that we are under-recognizing it. Experience has shown that the interviewers "relax" once they establish one diagnosis, usually diarrhoea



which is not difficult to identify in our setting. Thus, co-infections with ARI and diarrhoea are certainly being missed. Improved training and supervision is needed. Note also the unacceptable unknown rate, another indication of problems either in the instrument or in the collecting/assigning/coding processes.

Table D-5: Main cause of death: Age 0-5 years, 1991

MAIN CAUSE	No.	Percent
Diarrhoea syndromes	38	31.7
ARI/pneumonia	15	12.5
Birth injury/asphyxia	7	5.8
Prematurity/low birth weight	7	5.8
Injury	5	4.2
Malnutrition	1	0.8
EPI-preventable	0	0.0
Others	11	9.2
Unknown, ill-defined syndromes	36	30.0
TOTAL	120	100

Not shown, but a highly recommended next step, would be a set of tables (or columns) ranking causes of death by age. We usually look at deaths in newborns (0-28 days of age), post-neonatal infants (one through 11 months of age), and children one through four years of age.

Table D-6 shows the same children after analysis by consolidated cause. Note that the numbers refer to diagnoses, not children. Note also some important differences with Table D-5. First, malnutrition is ranked as the second most common cause with a proportionate mortality ratio of almost 15% (compared to a PMR of 0.8% as a main cause). This is because of our convention of coding it as an associated cause rather than a main cause. Also note that LBW assumes greater importance. Again this has been because of the decision to assign LBW as an associated cause (because the more proximate "biomedical" causes are infection, low temperature, low blood sugar, immature lungs, etc). Unfortunately these main causes are usually unknown. One could dispute this rule; we are probably trying to obtain an unrealistic degree of detail. Finally note that the unknown rate, while still high, is lower than in Table D-5 (which has many main causes listed as unknown).

Again, a separate set of tables (or columns) for various ages at death is suggested.

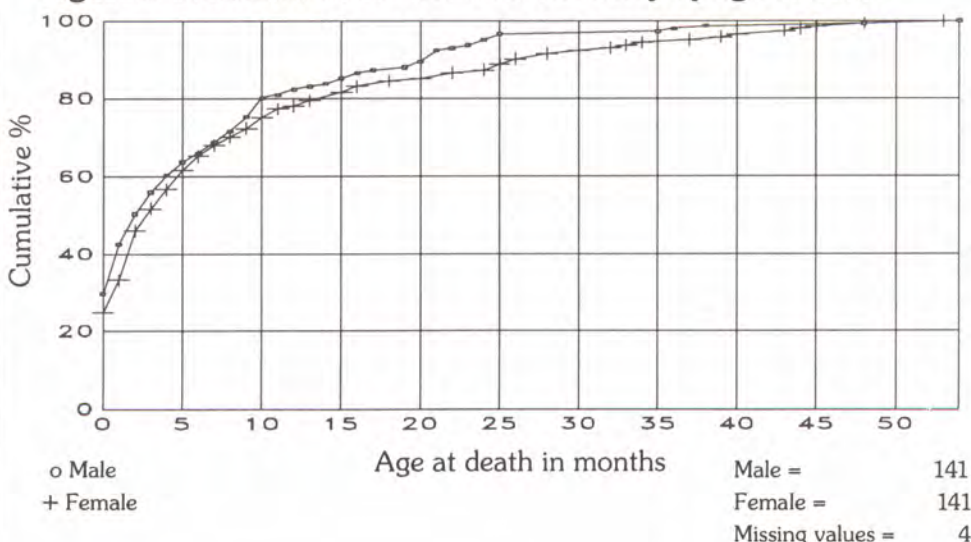


Table D-6: Consolidated* cause of death: Age 0-5 years, 1991

CONSOLIDATED CAUSE	No. Diagnosis	Percent
Diarrhoea syndromes	42	21.5
Malnutrition	29	14.9
Prematurity/low birth weight	27	13.8
ARI/pneumonia	19	9.7
Birth injury/asphyxia	7	3.6
Injury	5	2.6
EPI-preventable	1	0.5
Other	21	10.8
Unknown	45	23.1
TOTAL	196	100.5

(*main plus associated causes combined; counts refer to diagnoses, not patients)

Other types of descriptive analysis are rewarding and not difficult to perform by hand. For example, cumulative mortality curves (0-100% of mortality by age at death) depict the ages of death for various sub-sets of the data: by total, by sex, or by individual diagnosis. Figure D-1 is an example showing age of death by sex, two very similar curves (in that example).

Figure D-1: Cumulative under five mortality by age and sex

The table shows that almost 50% of infant mortality occurred in the first six weeks of life, a time when cultural practices make access to the baby difficult. Teaching trained birth attendants to recognize illness in young infants might be an answer. Likewise if a PHC manager has noticed that no ARI deaths occurred after 24 months of age, he should focus the target group of his ARI control programme more narrowly to the less than two years of age.

A cautionary note in recommending policy: mortality trends need several years of data before they can be assessed and, by the time they have been documented, they are probably already evolving. As PHC programme managers know, they are in the business of "changing the distribution of death." There are several reasons why the level and composition of mortality could change in a target group. For example, adding an ARI control programme would hopefully lower the ARI proportionate mortality ratio, the IMR, and the ARI ASCSMR. Comparable changes have been seen through EPI and CDD programmes.

In addition to specific programmatic inputs, the distribution of deaths is changing due to larger forces related to the "health transition" (a term coined to enlarge the search for the causes of improved health beyond the usual economic development and health services explanations). One definition of the health transition is the "social, cultural, and behavioral factors which parallel the epidemiologic transition and may do much to propel it." This related term, "epidemiologic transition," refers to the change in disease patterns usually accompanying "development," i.e., a decrease in (primarily childhood) mortality secondary to infection, malnutrition, and contaminated environment with an increase in morbidity and mortality due to chronic disease (in the aged) as the life expectancy increases and birth rates fall. The terms are often used interchangeably.

The bottom line is this: a "successful" PHC manager will among other achievements like "community empowerment" cause a favourable change in the level and distribution of deaths in target groups. This will probably be due to several effects: 1) specific programme activities, 2) more intangible "social" factors that encourage mothers to be more assertive in providing their children the care they need; and 3) cross-sectoral economic factors, such as income generation schemes.



Appendix E: Verbal autopsy protocols

E.1: NEWBORN AND CHILD DEATH INQUIRY

INSTRUCTIONS

INTERVIEWER:

1. Complete pages 1-3
2. Complete all the modules indicated on page 3

ASSIGNER:

1. Review the completed form.
2. For each module completed, complete the score column, and
3. Circle the most certain cause of death.

CODER:

1. For each module completed, review the assigned cause(s) of death.
2. Transfer all assigned causes of death to page 12, and
3. Tick *one* main cause and other associated causes (including *other* and *unknown*).
4. Comment as needed.

IDENTIFYING INFORMATION:

- 1) Village: _____ 2) Division: _____ 3) House #: _____
- 4) Family no.: _____ 5) I.D.#: _____
- 6) Name of deceased: _____ 7) Sex: M(); F()
- 8) Name of informant: _____
- 9) Relationship with deceased: _____
- 10) Date of birth: ____/____/____
- 11) Date of death: ____/____/____
- 12) Age at death: _____
- 13) Where did the child die? () 1. Residence
() 2. Private hospital/clinic
() 3. Govt. hospital
() 4. Other: specify: _____
- 14) Did the child receive treatment outside home before death?
() 1. Yes
() 2. No – GO TO QUESTION 17
() 3. Don't know – GO TO QUESTION 17



15) If YES, where did the child receive treatment?

- () 1. At PHC centre
 () 2. Private doctor
 () 3. Govt. hospital
 () 4. Private hospital
 () 5. Homeopath
 () 6. Unqualified person
 () 7. Other: Specify. _____

16) What treatment did the child receive? _____

INFORMATION FROM FAMILY FOLDER OR OTHER SOURCES:

17) Registration date ____/____/____

18) Total family monthly income _____

19) Is the father employed?

..... Yes (), No (), Don't know ()

20) Is the mother working away from home?

..... Yes (), No (), Don't know ()

21) Is the mother divorced/widowed/separated?

..... Yes (), No (), Don't know ()

22) Ethnic group _____

23) Religion _____

24) Nutritional status (most recent prior to last illness):

..... NL (); 1st (); 2nd (); 3rd ()

Immunization dates:

- | | | | |
|-------------|----------------|-------------|----------------|
| 25) BCG | ____/____/____ | 26) Measles | ____/____/____ |
| 27) DPT 1 | ____/____/____ | 28) DPT 2 | ____/____/____ |
| 29) DPT 3 | ____/____/____ | 30) Polio 1 | ____/____/____ |
| 31) Polio 2 | ____/____/____ | 32) Polio 3 | ____/____/____ |



33) How did the child die? (Include the informant's **exact words**. Probe, but do not interpret the history. Focus on physical events)

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There is no handwriting or other markings on the paper.

SCREENING QUESTIONS FOR CAUSES OF DEATH

Interviewer: Tick each condition present within three days of death, and go to all modules indicated.

(N = no; Y = yes; DK = don't know)

No.	Condition	Present within 3 days of death?			If Y or DK, go to:
		N	Y	DK	
34	Three or more loose stools in 24 hours?				DIARRHOEA ⇒ page 95
35	Cough? OR rapid breathing > 12 hrs? or difficult breathing > 12 hrs? or noisy breathing > 12 hrs?				ARI ⇒ page 96
36	Cough with vomiting in baby over three months old?				PERTUSSIS ⇒ page 97
37	Extreme sleepiness & fever? OR irritability & fever? OR convulsions?				BRAIN INFECTION ⇒ page 98
38	Stiff body? OR lockjaw? OR convulsions?				TETANUS ⇒ page 99
39	Death in the 1st week of life?				PERINATAL ⇒ page 100
39a	Underweight OR malnourished (local term)				MALNUTRITION ⇒ page 101
40	Injury or accident?				INJURY ⇒ page 102

No.	Condition at time of death or within three months	Present within 3 days of death?			If Y or DK, go to:
		N	Y	DK	
41	Rash with cough <i>within three months prior to death?</i> When: _____				MEASLES ⇒ page 103



DIARRHOEA

Interviewer: Answer each question. (**DK** = don't know; **N** = no; **Y** = yes)

Assigner: For each “**Y**,” enter the weight letter in the score column.

Refer to the SCORING CAUSE OF DEATH table to assign cause of death.

No.	Was this symptom present?	N	Y	DK	Weight	Score
42	Were there three or more loose or liquid stools per day?				E	
43a	Did the baby have: dry mouth? OR				any = S	
43b	sunken fontanel? OR					
43c	extreme thirst? OR					
43d	sunken eyes?					
44a	Was there blood in the stools? OR				any = D	
44b	Was there severe cramping? OR					
44c	Was there fever?					
45	Did the loose stools persist for more than two days?				C	
46	Did the loose stools persist for more than 14 days?				P	

SCORING CAUSE OF DEATH: DIARRHOEA SYNDROMES

Assigner: Circle all possible causes at the highest level of certainty

Diagnostic likelihood	ACUTE WATERY DIARRHOEA	DYSENTERY	PERSISTENT DIARRHOEA
probable	1E + 1C + 1S	1E + 1D + 1C	1E + 1P + 1S 1E + 1P + 1D
possible	1E + 1 S	1E + 1D	1E + 1P



ARI

Interviewer: Answer each question. (**DK** = don't know; **N** = no; **Y** = yes)

Assigner: For each "**Y**," enter the weight letter in the score column.
Refer to the SCORING CAUSE OF DEATH table to assign cause of death.

No.	Was this symptom present?	N	Y	DK	Weight	Score
47	Was there a cough for more than two days?				E	
48	Was there rapid breathing for more than 1/2 day?				E	
49a	Was there, for more than 1/2 day: chest wall indrawing? OR				any = E	
49b	nostril flaring? OR					
49c	grunting on breathing out? OR					
49d	blue lips or tongue?					

SCORING CAUSE OF DEATH: ARI

Assigner: Circle cause at the highest level of certainty

<i>Diagnostic likelihood</i>	ARI
probable	3E
possible	2E



PERTUSSIS

Interviewer: Answer each question. (**DK** = don't know; **N** = no; **Y** = yes)

Assigner: For each "Y" or unshaded "DK," enter the weight letter in the score column.

Refer to the SCORING CAUSE OF DEATH table to assign cause of death.

No.	Was this symptom present?	DK	N	Y	Weight	Score
50	Were there bouts of severe coughing for more than two weeks?				C	
51	Was there choking or vomiting after coughing bouts?				C	
52	Was there a "whoop" sound during breathing in?				C	
53	Was there swelling of the eyelids?				S	
54	Were there other cases of "whooping cough" in the village/neighbourhood?				S	
55	Did the baby receive three or more DPT shots?				X	

SCORING CAUSE OF DEATH: PERTUSSIS

Assigner: Circle cause at the highest level of certainty

<i>Diagnostic likelihood</i>	PERTUSSIS
probable	3C + no X or 2C + 2S + no X
possible	2C + no X



BRAIN INFECTION

Interviewer: Answer each question. (**DK** = don't know; **N** = no; **Y** = yes)

Assigner: For each "**Y**" or unshaded "**DK**," enter the weight letter in the score column.

Refer to the SCORING CAUSE OF DEATH table to assign cause of death.

No.	Was this symptom present?	DK	N	Y	Weight	Score
56	Was there fever?				E	
57	Was the child more irritable when picked up than when left alone?				C	
58	Was there extreme sleepiness?				C	
59	Was the neck stiff?				C	
60	Were there any convulsions?				C	
61	Was there a raised fontanel?				S	
62	Was there vomiting?				S	

SCORING CAUSE OF DEATH: BRAIN INFECTION

Assigner: Circle cause at the highest level of certainty

<i>Diagnostic likelihood</i>	BRAIN INFECTION
probable	1E + 3C or 1E + 2C + 2S
possible	1E + 2C



TETANUS

Interviewer: Answer each question. (**DK** = don't know; **N** = no; **Y** = yes)

Assigner: For each "**Y**," enter the weight letter in the score column. Refer to the SCORING CAUSE OF DEATH table to assign cause of death.

Table A. NEWBORNS DYING BETWEEN AGE 3-28 DAYS OF LIFE						
(younger newborns go to PERINATAL MODULE; older children: see Table B below)						
No.	Was this symptom present?	DK	N	Y	Weight	Score
63	Was the death between 3-28 days of age?				E	
64	Was the baby able to suck well after birth?				E	
65	Was the jaw locked?				C	
66a	Was there: back-arching/ rigidity? OR				any = C	
66b	convulsions?					

SCORING CAUSE OF DEATH: TETANUS SYNDROMES

Assigner: Circle all possible causes at the highest level of certainty

Diagnostic likelihood	NEWBORN TETANUS	CHILD TETANUS
probable	2E + 2C	3Ch
possible	2E + 1C	2Ch



PERINATAL SYNDROMES

Interviewer: Answer each question. (DK = don't know; N = no; Y = yes)

Assigner: For each "Y," enter the weight letter in the score column.
Refer to the SCORING CAUSE OF DEATH table to assign cause of death.

No.	Was this symptom present?	DK	N	Y	Weight	Score
67	Did the baby die before age 7 days?				E	
68	Did the baby fail to shown signs of life? (crying, breathing, moving)				SB	
69a	Was the baby smaller than usual? AND				both = PR	
69b	born of a pregnancy of < 8 months?					
70a	Was the baby smaller than usual? AND				both = SGA	
70b	born of a pregnancy of >or = 8 months?					
71	Did the baby not cry for at least five minutes after birth?				C	
72	Did the baby have convulsions?				C	
73	Was the delivery longer than 12 hours?				C	
74	Did the baby show any abnormality of head, chest/abdomen, arms/legs?				A	

SCORING CAUSE OF DEATH: PERINATAL SYNDROMES

Assigner: Circle all possible causes at the highest level of certainty

Diagnostic likelihood	STILL BIRTH	PREMATURITY	SMALL FOR GESTATIONAL AGE	BIRTH INJURY/ ASPHYXIA	CONGENITAL ANOMALY
probable	1E + 1SB			1E + 3C	1E + 1A
possible		1E + 1 PR	1E + 1SGA	1E + 2C	



MALNUTRITION

Interviewer: Answer each question. (**DK** = don't know; **N** = no; **Y** = yes)

Assigner: For each “**Y**,” enter the weight letter in the score column.

Refer to the SCORING CAUSE OF DEATH table to assign cause of death.

No.	Was this symptom present?	DK	N	Y	Weight	Score
75	In the month before death was the child: Listless? OR Lacking energy? OR Disinterested in surroundings?				C	
76	Did the child have malnutrition (local term)?				C	
77	FOR CHILDREN > six MONTHS: Was the child fed any milk besides breast milk before age six months?				C	
78	In the three months before death, did the child have diarrhea three or more times?				S	
79	In the three months before death did any diarrhea episode last more than 14 days?				S	
80	In the three months before death did the child have diarrhea AND pneumonia (either at the same time or at different times)?				S	
81	Was the child especially hungry compared to other children his/her age?				S	

SCORING CAUSE OF DEATH: MALNUTRITION

Assigner: Circle cause at the highest level of certainty

<i>Diagnostic likelihood</i>	MALNUTRITION
probable	2C 1C - 2S
possible	1C or 3S



INJURY

Interviewer: Answer each question. (**DK** = don't know; **N** = no; **Y** = yes)
 Make sure that the informant's history is complete (page 2).
 Additional space is provided below if needed.

No.	Were any of these situations present?	DK	N	Y
82	Was there a bite or sting from an animal or poisonous insect?			
83	Was there a burn?			
84	Was there drowning?			
85	Was there poisoning?			
86	Was there a traffic accident?			
87	Was there a fall?			
88	Was there choking?			
89	Was there cutting or piercing from a sharp object or bullet-like projectile?			

SCORING CAUSE OF DEATH: INJURY

Assigner: Each "Y" represents a probable injury diagnosis.

<i>Diagnostic likelihood</i>	INJURY
probable	1Y



MEASLES

Interviewer: Answer each question. (**DK** = don't know; **N** = no; **Y** = yes)

Assigner: For each "Y," enter the weight letter in the score column.

Refer to the SCORING CAUSE OF DEATH table to assign cause of death.

No.	Was this symptom present?	DK	N	Y	Weight	Score
90	Did the child die after age four months?				E	
91	Was there rash for more than three days?				E	
92	Was there fever for more than three days?				E	
93	Was there cough with the rash?				E	
94	<i>IF the child survived for more than five days after the rash started, did the skin peel all over? (not applicable)</i>				C	
95	During the fever & rash, were the eyes red?				C	
96	Were there other cases of measles in the house or in the village/neighbourhood?				S	
97	In your opinion, did the child have measles within three months of death?				S	
98	Did the rash ever look like little blisters filled with water?				X	

SCORING CAUSE OF DEATH: MEASLES

Assigner: Circle cause at the highest level of certainty

<i>Diagnostic likelihood</i>	MEASLES
probable	4E + 2C + no X or 4E + 1C + 2S + no X
possible	4E + 1C + no X



CAUSE OF DEATH: CODING CHART

Coder: Follow decision rules to code cause of death by ONE main and any associated cause(s). Add comments as desired. Sign and date. Thank you.

DX Code no.	CAUSE OF DEATH	probable	possible	Main (1 only)	Associated
	Acute watery diarrhoea				
	Dysentery				
	Persistent diarrhoea				
	ARI				
	Pertussis				
	Measles				
	Brain infection				
	Malnutrition				
	Neonatal tetanus				
	Childhood tetanus				
	Stillbirth				
	Prematurity				
	Small for gestational age				
	Birth injury/asphyxia				
	Congenital anomaly				
	Injury: specify				
	Other: specify				
	Unknown				

CODER COMMENTS:

CODER SIGNATURE: _____ DATE: _____

REVIEWER COMMENTS:

REVIEWER SIGNATURE: _____ DATE: _____



NEWBORN AND CHILD DEATH INQUIRY

INSTRUCTIONS TO TRAINERS AND INTERVIEWERS:

EXPLANATION OF QUESTIONS

No. Explanation

34. Three or more loose stools in 24 hours: separate episodes in a day
35. Cough:
Rapid breathing: faster than normal
Difficult breathing: requires more muscular effort; sucking in of skin between/above/below ribs; unable to drink normally; chest wall caving in
Noisy Breathing: normal breathing is quiet; noisy breathing has sounds on breathing in or out; squeaks, wheezes, grunts
36. Cough with vomiting: coughing so hard that it causes the baby to vomit
37. Extreme sleepiness and fever: does not wake up enough to recognize mother or eat properly
Irritability and fever: cries more than usual
38. Stiff body:
Lockjaw: jaw won't fully open
41. Rash with cough within three months of death: red spots on body
42. Same as 34
- 43a. Dry mouth: loss of wetness or saliva on inner lips, inner cheeks, tongue
- 43b. Extreme thirst: frantic for liquids
- 43c. Sunken eyes: eyes that look "owlish" with darkish depressions around them due to loss of water
- 43d. Sunken fontanel: baby's soft spot may normally sink a bit when upright; this is much more than that
- 44a. Blood in stool: usually small reddish spots in the motions, but may be lots
- 44b. Severe cramping: cries just before or during passing motions
- 44c. Fever: temperature above 101 degrees F (38.5 C) or felt warm
45. Loose stools persist for more than two days: at least into the 3rd day
46. Loose stools persist for more than 14 days: passed loose stools daily for this period
47. Cough for more than 2 days: at least into the third day
48. Rapid breathing: see 35
- 49a. Chest wall in-drawing: lower ribs suck in with breathing in (the



- opposite of what normally happens)
- 49b. Nostril flaring: nostrils widen and open up to let more air in
 - 49c. Grunting on breathing out: brief vocalizations during exhaling as if in pain; best to demonstrate: "hgh" (listen to your trainer)
 - 49d. Blue lips or tongue: dusky blueness (can also be seen in nail beds)
 - 50. Bouts of severe coughing: coughing spells for more than a minute separated by quiet episodes
 - 51. Choking or vomiting after coughing bouts: like 36, but adds the idea of choking. Babies can choke either on mucus or their vomit
 - 52. "Whoop" sound: or "Hooo" sound as baby breathes in usually at the end of a long coughing bout
 - 53. Swelling of eyelids: puffiness of upper and/or lower lids
 - 55. Did the baby receive three or more DPT shots: by written record only. Most will not be able to prove this
 - 56. Fever: see 44c
 - 57. More irritable when picked up: usually sick children prefer to be picked up and become less irritable. Babies who hurt don't want to be touched
 - 58. Extreme sleepiness: see 37
 - 59. Neck stiff: hurts to bend the neck forward. The head may be bent back
 - 60. Convulsions: episodes of jerking of arms and/or legs with or without loss of consciousness; seizures, fits
 - 61. Raised fontanel: full or bulging soft spot, especially when baby held erect
 - 63. Death between 3-28 days: dying on the 3rd through the 28th day of life
 - 64. Suck well after birth: Normal sucking at least three different times
 - 65. Jaw locked: can't open enough to suck
 - 66a. Back arching: back bent backwards and stiff in that position
 - 66b. Convulsions: see 60
 - 67. Die before age seven days: dies in the first week of life
 - 68. Fail to show signs of life: was the baby dead at birth, i.e., without heartbeat, breathing, crying, movement or arms/legs/face muscles
 - 69a. Smaller than normal: smaller than the usual newborn? or less than 2500 grams (if weighed)
 - 69b. Pregnancy < 8 months: premature
 - 70a. See 69a
 - 70b. Pregnancy or = 8 months: at full term or nearly so
 - 71. Not cry for at least five minutes after birth: almost all healthy babies



cry after a few seconds or minutes of birth. Five minutes is a long time NOT to cry, and the mother should remember it

72. Convulsions: see 60; they are harder to see in a newborn
73. Delivery 12 hours: was there pushing for more than 12 hours
82. Bite or sting: animal (large or small): mammal, bird, insect, spider, reptile, fish, jellyfish, and so on
83. Burn: from flame, heater, stove, etc.
84. Drowning: in pond, river, sea, bucket of water, dish of milk, etc.
85. Poisoning: medicine, plant, cleaner, chemical, insecticide, petrol, rat poison, etc.
86. Traffic accident: an event involving any of the following: pedestrian and/or passengers on wheeled conveyance (car, rickshaw, bicycle, tonga, motorcycle, bus, etc.)
87. Fall: from standing onto a hard surface, from a tree, from a cliff, etc.
88. Choking on food, on a toy, on a stick; suffocating while sleeping, etc.
89. Cutting, piercing object: gunshot, knifeblade, glass, arrow, etc.
90. After age four months: after he turned four months
91. Rash for more than three days: at least into the fourth day
92. Fever for more than three days: see 44c
93. Cough with rash: cough for three days also
94. Peeling rash after the fifth day: skin flakes off
95. Red eyes: visible red lines (tiny blood vessels) or generalized redness of the whites of the eyes
98. Rash look like blisters; did it look like chickenpox



E.2: MATERNAL DEATH INQUIRY

INSTRUCTIONS

INTERVIEWER:

1. Complete pages 1-3.
2. Complete all the modules indicated on page 3.

ASSIGNER:

1. Review the completed form.
2. For each module completed, complete the score column, and
3. Circle the most certain cause of death.

CODER:

1. For each module completed, review the assigned cause(s) of death.
2. Transfer all assigned causes of death to page 10, and
3. Tick *one* main cause and other associated causes (including *other* and *unknown*).
4. Comment as needed.

IDENTIFYING INFORMATION

- 1) Name of deceased: _____
- 2) I.D.#: _____
- 3) Village: _____
- 4) Division: _____
- 5) House #: _____
- 6) Family no.: _____
- 7) Name of informant: _____
- 8) Relationship to deceased: _____
- 9) Date of deceased's birth: _____
- 10) Date of deceased's death: _____
- 11) Deceased's age at death: _____
- 12) Total family monthly income: _____
- 13) Language group: _____
- 14) Religion: _____
- 15) What was her marital status at the time of death? _____
☐ Married ☐ Divorced ☐ Separated
☐ Widowed ☐ Single
- 16) If MARRIED, how long had she been married?(____)
- 17) How many time had she been pregnant?(____)
- 18) How many abortions had she had?(____)
- 19) How many stillbirths had she had?(____)
- 20) How many children were born alive to her?(____)
- 21) How many of those children are still alive?(____)



SCREENING QUESTIONS FOR CAUSES OF DEATH

Interviewer: Tick a response for each TIME and sign combination, and go to *all* modules indicated.

(**N** = no; **Y** = yes; **DK** = don't know)

No.	Time and Sign	Present at death?			If Y or DK, go to:
		N	Y	DK	
31	Post-delivery AND fever OR foul smelling vaginal discharge				PUERPERAL INFECTION ⇒ page 111
32	Mid- OR late pregnancy AND vaginal bleeding up to death				ANTEPARTUM HEMORRHAGE ⇒ page 112
33	Post-delivery AND vaginal bleeding up to death				POSTPARTUM HEMORRHAGE ⇒ page 113
34	During labour AND baby not delivered in 24 hours				OBSTRUCTED LABOR ⇒ page 114
35	During pregnancy OR labour OR delivery OR delivery day AND seizures				ECLAMPSIA MODULE ⇒ page 115
36	Early OR mid-pregnancy AND fever OR				ABORTION (MISCARRIAGE) ⇒ page 116
37	Abdominal pain OR foul smelling vaginal discharge				



PUERPERAL INFECTION

Interviewer: Answer each question. (DK = don't know; N = no; Y = yes)

Assigner: For each "Y," enter the Weight letter in the score column. Refer to the ASSIGNING CAUSE OF DEATH table to assign cause of death.

No.	Sign or symptom	No	Don't know	Yes	Weight	Score
38	Was the death after delivery?				E	
39	Was the death within six weeks of delivery?				E	
40	Was the death within one week of delivery?				C	
41	Was there fever?				S	
42	Were there chills and sweats?				C	
43	Was there a foul-smelling vaginal discharge?				C	
44	Was there abdominal pain (below the navel)?				C	
45	Was there bleeding from several sites?				C	

RULES FOR ASSIGNING CAUSE OF DEATH: PUERPERAL SEPSIS

Assigner: Determine the score (above), and circle the highest level of certainty.

<i>Probability</i>	<i>Score</i>
possible	2E + 1C + 1S
probable	2E + 2C



ANTEPARTUM HEMORRHAGE

Interviewer: Answer each question. (DK = don't know; N = no; Y = yes)

Assigner: For each "Y," enter the Weight letter in the score column. Refer to the ASSIGNING CAUSE OF DEATH table to assign cause of death.

No.	Sign or symptom	No	Don't know	Yes	Weight	Score
46	Did the death occur in mid- or late pregnancy?				E	
47	Was the woman not in labor?				E	
48	Was the bleeding painless?				P	
49	Had there been previous painless vaginal bleeding during this pregnancy?				PS	
50	Was there sudden abdominal pain below the navel?				A	
51	Did the abdomen swell below the navel?				AS	

RULES FOR ASSIGNING CAUSE OF DEATH: ANTEPARTUM HEMORRHAGE

Assigner: Determine the score (above), and circle the highest level of certainty.

Probability	Diagnosis Score	
	Placenta Previa	Placental Abruption
possible	2E + 1P	2E + 1A
probable	2E + 1P + 1PS	2E + 1A + 1AS



POSTPARTUM HEMORRHAGE

Interviewer: Answer each question. (**DK** = don't know; **N** = no; **Y** = yes)

Assigner: For each "**Y**," enter the Weight letter in the score column. Refer to the ASSIGNING CAUSE OF DEATH table to assign cause of death.

No.	Sign or symptom	No	Don't know	Yes	Weight	Score
52	Was there heavy vaginal bleeding up to the time of death, such as: bright red blood? OR clots?OR pads could not keep up with it?				E	
53	Was the afterbirth incompletely delivered?				C	
54	Were shreds of membranes visible in the birth canal?				C	

RULES FOR ASSIGNING CAUSE OF DEATH: POSTPARTUM HEMORRHAGE

Assigner: Determine the score (above), and circle the highest level of certainty.

<i>Probability</i>	<i>Score</i>
possible	1E
probable	1E + 1C



OBSTRUCTED LABOR

Interviewer: Answer each question. (**DK** = don't know; **N** = no; **Y** = yes)

Assigner: For each "Y," enter the Weight letter in the score column. Refer to the ASSIGNING CAUSE OF DEATH table to assign cause of death.

No.	Sign or symptom	No	Don't know	Yes	Weight	Score
55	Was the woman in labour for more than 24 hours?				E	
56	Was the woman in labour for more than 48 hours?				C	
57	Was the abdominal pain worse than the usual pains of labour?				C	
58	Was there abdominal swelling or change in abdominal shape?				C	
59	Was there heavy vaginal bleeding up to the time of death?				C	
60	Was there an abnormal presentation of the baby (feet, bottom, arm, shoulder, cord first; or twins)?				S	
61	Was the mother short (less than five feet or less than 150 cm)?				S	
62	Was there a history of large previous babies?				S	

RULES FOR ASSIGNING CAUSE OF DEATH: OBSTRUCTED LABOR

Assigner: Determine the score (above), and circle the highest level of certainty.

<i>Probability</i>	<i>Score</i>
possible	1E + 2C
probable	1E + 2C + 2S or 1E + 3c



ECLAMPSIA

Interviewer: Answer each question. (**DK** = don't know; **N** = no; **Y** = yes)

Assigner: For each "**Y**," enter the Weight letter in the score column. Refer to the ASSIGNING CAUSE OF DEATH table to assign cause of death.

No.	Sign or symptom	No	Don't know	Yes	Weight	Score
63	Was the woman pregnant?				E	
64	Was there at least one seizure?				E	
65	Was there swelling of the: face? OR Hands and ankles? OR				C	
66	Was there high blood pressure during the pregnancy?				C	
67	Was this the first pregnancy?				S	
68	Was there: headache? OR visual disturbance?				S	
69	Was there abdominal pain?				S	

RULES FOR ASSIGNING CAUSE OF DEATH: ECLAMPSIA

Assigner: Determine the score (above), and circle the highest level of certainty.

Probability	Score
possible	2E + 1C
probable	2E + 2C or 2E + 1C + 2S



ABORTION (MISCARRIAGE)

Interviewer: Answer each question. (**DK** = don't know; **N** = no; **Y** = yes)

Assigner: For each "**Y**," enter the Weight letter in the score column. Refer to the ASSIGNING CAUSE OF DEATH table to assign cause of death.

No.	Sign or symptom	No	Don't know	Yes	Weight	Score
70	Was the woman in early or mid-pregnancy?				E	
71	Was there fever?				C	
72	Was there foul smelling vaginal discharge?				C	
73	Was there abdominal pain below the navel?				C	
74	Was there: Depression OR Unwanted pregnancy OR				C	
75	Was there vaginal bleeding up to time of death?				C	
76	Was there passage of incompletely formed baby or tissue?				E	

RULES FOR ASSIGNING CAUSE OF DEATH: Abortion (miscarriage) Related

Assigner: Determine the score (above), and circle the highest level of certainty.

<i>Probability</i>	<i>Score</i>
possible	2E + 1C
probable	2E + 2C



CAUSE OF DEATH: CODING CHART

Coder: Follow decision rules to code cause(s) of death by *ONE* main and any *associated* cause(s). Add comments as desired. Sign and date. Thank you.

DX code no.	Cause of death	probable	possible	main (1 only)	associated
	Puerperal infection				
	Placenta previa				
	Placental abruption				
	Postpartum hemorrhage				
	Obstructed labor				
	Eclampsia				
	Abortion-related				
	Other: (specify)				
	Unknown				

CODER COMMENTS:

CODER SIGNATURE: _____ DATE: _____

REVIEWER COMMENTS:

REVIEWER SIGNATURE: _____ DATE: _____



DEFINITIONS: TIME OF DEATH AND MAJOR SIGNS

Time of death

- Early pregnancy; missed periods with prior regular periods; breast swelling; without noticeable abdominal swelling; may not be known by anyone, including the decedent
- Mid-pregnancy; visibly pregnant; no periods for 4-6 months; baby due in 3-5 months; baby may be kicking; usually noticed by family; almost always by the mother-to-be
- Late pregnancy; very visibly pregnant; definite baby kicking; no periods for 6-9 months; baby due in 0-3 months
- Labour; intermittent pains present with or without the urge to push; passage of water; bloody show
- Delivery; urge to push with the appearance and birth of the baby and passage of the afterbirth
- Post-delivery; within 42 days of delivery

Signs

- Vaginal bleeding up to death: passage of copious bright red blood, dark blood, or clots from the vagina/birth canal
- Seizures: interrupted consciousness with stiffening and/or jerking of one or more limbs, +/- jaw clenching, +/- loss of urinary continence
- Abdominal pain/tenderness (not in labour): in this case, usual lower mid-line, anterior discomfort which is below the navel, i.e., where the womb is
- Difficult delivery with labour 24 hours: the normal discomfort of intermittent labor pains evolved into prolonged bouts of unrelenting pain, often with maternal physical and mental exhaustion without achieving delivery within a day's time
- Fever: temperature above 100 degrees F or "feels warm to touch" or intermittently clammy (cold) and flushed (sweaty, warm) skin; may have chills (mild shivers) or rigours (severe shivers)
- Foul-smelling vaginal discharge: bloody or purulent mucus discharge from vagina/birth canal that has an unusually bad odor



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Acronyms and abbreviations

AKF	Aga Khan Foundation
AKU	Aga Khan University
ALRI	Acute lower respiratory infection
ANC	Antenatal care
ARI	Acute respiratory infection
AWD	Acute watery diarrhoea
BCG	Bacillus of Calmette and Guérin
CCCD	Combating Childhood Communicable Diseases
CDC	Center for Disease Control, U.S. Public Health Service (USA)
CDD	Control of diarrhoeal diseases
CHN	Community health nurse
CHW	Community health worker
DPT	Diphtheria, pertussis, tetanus
EPI	Expanded Programme on Immunization
FUO	Fever of unknown origin
GM	Growth monitoring
HH	Household
HIV	Human immunodeficiency virus
IEC	Information, education, communication
IMR	Infant mortality rate
LBW	Low birth weight
MCH	Maternal and child health
MIS	Management information system
MMR	Maternal mortality rate
MOH	Ministry of health
NNT	Neonatal tetanus
OPV	Oral poliovirus vaccine
ORS	Oral rehydration salts
ORT	Oral rehydration therapy
PHC	Primary health care
PHC MAP	Primary Health Care Management Advancement Programme
PMR	Proportionate mortality rate
SGA	Small for gestational age
STD	Sexually-transmitted diseases
TB	Tuberculosis
TBA	Traditional birth attendant
TT	Tetanus toxoid
WHO	World Health Organization



Glossary

Attack rate: The percentage of individuals in a defined group who get a disease over a defined time period.

Case: An individual situation or occurrence. In health this usually refers to an individual person with a disease, health problem or who has died.

Case fatality rate: The proportion who die, of the number of persons diagnosed as having a specific disease.

Catchment (area): The geographic area surrounding one or more health facilities. It refers to the population residing in that area, which includes the programme's target populations.

Census: A count of all members of a population.

Community health worker (CHW): A person indigenous to the community who provides basic health promotion, disease prevention and curative health services to members of the community. Includes "village health workers," "health guides," and other terms.

Coverage: The proportion of a target group that has received a service or is protected from a disease or health problem.

Disease surveillance: The collection of information about cases of diseases and the use of that information to evaluate the effectiveness of preventive activities to correct any problems which hinder disease-reduction objectives from being met.

Disease trend: The pattern formed by increases and decreases in the number of reported cases of disease over time.

Effectiveness: The degree to which desired outcomes are achieved.

Efficiency: The degree to which desired outcomes are achieved without wasting resources.

Endemic: The constant presence of a disease or infectious agent within a given geographic area.

Epidemic: The occurrence in a community or region of more cases of a disease than usually occur in a specified period of time. Synonym: outbreak.

Epidemic pattern: The occurrence of a disease in a pattern in which more cases occur during certain periods of time than in other periods.

Incidence: The number of new cases of a disease in a defined population during a specified period of time.

Incubation: The time interval between initial contact with an infectious agent and the appearance of the first sign or symptom of disease.

Indicator: An indirect measure of an event or condition. For example, a baby's weight-for-age is an indicator of the baby's nutritional status.



Inputs: Resources, e.g., personnel, equipment, information and money.

Lay definition: Non-medical definition, using terminology easily understood and used by non-clinical individuals to describe a medical event or condition.

Management: The art and science of getting things done through people.

Objectives: The output and/or effect your PHC programme hopes to have.

Outbreak: The occurrence in a community or region of more cases of a disease than usually occur in a specified period of time. Synonym: epidemic.

Outbreak investigation: A study conducted for the purpose of collecting data about an outbreak, with the objective of controlling the outbreak and preventing similar outbreaks in the future.

Outcomes: Results of your PHC programme, including outputs, effects and impacts.

Outputs: Products and services provided by a PHC programme.

Effects: Changes in knowledge, skills, attitude, and behaviour (including coverage) as a result of a PHC programme.

Impacts: Changes in health status, (mortality, morbidity, disability, fertility) as a result of a PHC programme.

Percentage: A proportion multiplied by 100. For example 3,500 children immunized out of 5,000 $\times 100$. $(3,250/5,000) \times 100 = 65\%$.

Prevalence: The total number of cases of a disease in a defined population at a specified point in of time. Also used with "coverage," as with the "contraceptive prevalence rate," meaning the proportion of the target population that is currently practising family planning.

Primary health care: Essential health care, accessible at affordable cost to the community and the country, based on practical, scientifically sound and socially acceptable methods. It includes at least eight components: health education, proper nutrition, basic sanitation, maternal and child health care, immunization, control of common diseases and injuries, prevention of local endemic diseases and provision of essential drugs.

Processes: Activities or tasks carried out through the PHC programme.

Proportion: A special type of ratio expressing a relationship between a part and the whole. For example, 3,250 children immunized out of 5,000 $(3,250/5,000 = .65)$.

Rate: A measure of the frequency of occurrence of an event, such as cases per month.

Ratio: Two numbers related to each other in a fraction or decimal, such as the number of cases of measles per 1,000 children. Any fraction, quotient, proportion, or percentage is a ratio.



Routine reporting site: Compilation and reporting of selected epidemiological data by all health facilities in a designated surveillance area. Data are usually taken from routine records.

Seasonal variation: The occurrence of a disease in a pattern where more cases occur in one (or more) seasons of the year.

Sentinel reporting site: A health facility that is specially chosen to collect and report specific epidemiological data, often taken from special records and forms.

Signs of disease: The evidence of disease found in a case by the examiner.

Special surveys: Studies that collect data that cannot be obtained from routine and sentinel reporting systems.

Symptoms of disease: The sensations of disease felt by the patient.

System: A set of discrete, but interdependent, components designed to achieve one or more objectives.

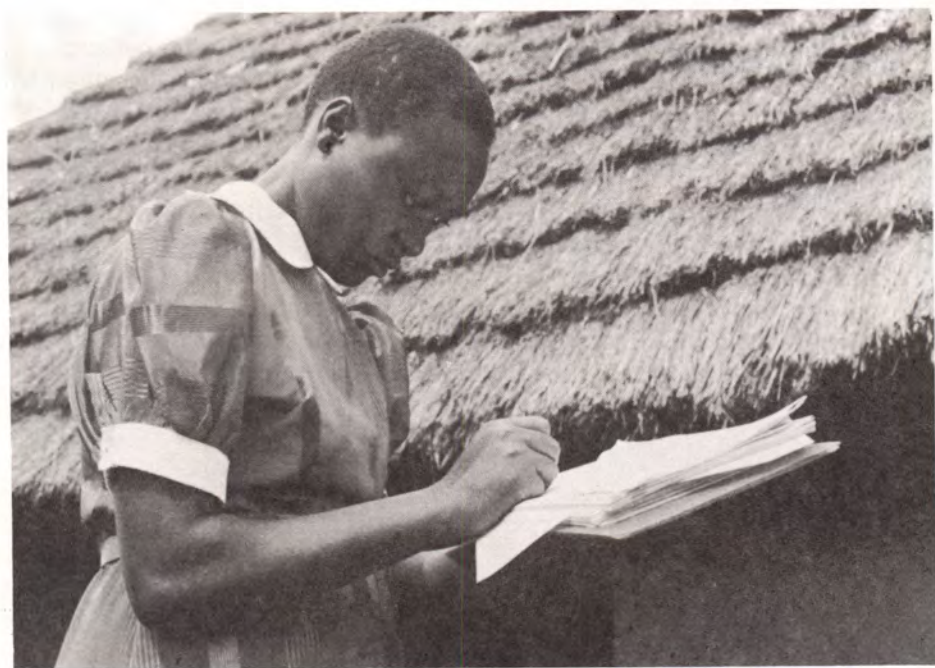
Target group: Specific groups of people designated to receive a PHC service, such as children under age three.

Vaccine efficacy: The ability of a vaccine to prevent disease when used in routine immunization services.

Verbal autopsy: An in-depth investigation by structured interviews of the cause of death and the circumstances leading up to it.

Vital registration: Recording and reporting of births and deaths on a routine basis to a central authority by public and private health providers.





School children can be a useful resource for identifying health risks at home, promoting healthy behaviour, maintaining simple records and controlling common local diseases

Photo by Jean Luc Ray for AKF



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MODULE 4

USER'S GUIDE

